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CASE OF LITHOTOMY.

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THE case in question was that of a grey gelding about eight years' old, a trooper in the 13th Regiment of Bengal Lancers, and which had been treated for about three years past by the regimental salootrie, or "native farrier," for some sort of kidney-disease, "the nature of which was never defined," on account of incontinence of urine, which was passed at frequent intervals and in small quantities. In the end of last July, the case was brought to the notice of W. R. Hagger, Esq., A.V.D., who was in veterinary charge of the station in which the regiment was quartered, and who at once diagnosed a calculus in the bladder. At Mr. Hagger's request I examined the animal, and *per rectum* the stone could easily be felt. It appeared to be flattened, and oval in shape, about 2½ inches thick, 4 inches wide, and 5 inches long, with a roughened surface, and freely movable in the bladder. As the rainy season had set in, and the weather was moist and hot, and most unfavourable for the healing of wounds; and, furthermore, taking into consideration that the case had been going on for some years, that owing to the size of the stone a large incision would have to be made, and that probably in the operation the surrounding tissues would be bruised a good deal, we came to the conclusion to postpone the operation till the cold weather. The animal was sent into the college-hospital, and operated on on the 5th November, as there were greater facilities and conveniences for after-treatment there than in the lines of a native regiment; and, also, the case was a good illustrative one for the students. The opera-

tion was performed at 9.30 a.m., both W. R. Hagger, Esq., A.V.D., and H. Pease, Esq., A.V.D., veterinary surgeon to the Punjab Government, being present. Chloroform was given in the usual manner by Mr. Pease, but at first the animal was most intolerant of it, there being most violent jugular regurgitation and threatened syncope ; so much so that, at one time, it was feared the operation would have to be attempted without the anæsthetic. The usual incision was made in the perinæum on to a catheter, and when the urethra was dilated the stone was easily felt, the outside being very rough. In making the incision for this operation, I have found it of the greatest advantage to extend it as far upwards as possible. An attempt was made to dilate the urethra and neck of the bladder, and extract the stone whole, but on account of its large size this had to be abandoned. The lithotrite supplied from the Government Medical Depôt was too small to grasp the calculus, and it had to be broken up by means of the steel sound and a hammer, the stone being held firmly in position by the forceps to prevent injury to the bladder as far as practicable. The sound was driven through it in one direction, and as much broken down as possible, and an attempt then made to crush it by the forceps, which failed. The position of the stone was again altered, and it was again drilled through diagonally to the former hole. On pressure being this time applied by the forceps, it broke down, and the pieces were removed in the ordinary manner, the minute fragments being washed out. The wound was then sutured, and a stimulating draught given, the whole operation occupying a little short of two hours. The animal was in a most prostrate state afterwards, the temperature rising to 104·8° F. by 4.30 p.m., when he appeared to be in a moribund condition. The temperature continued elevated till the 10th, when it reached its climax, viz., 106°, from which date it gradually fell. On the 12th the sutures were removed, about half an inch of the lower portion of the wound having healed by first intention. The urine was discharged by the perineal wound up to the 24th, when a small quantity was passed through the penis. The wound was fast healing up, and the catheter passed daily, to prevent any adhesions taking place in the urethra. On the 13th December the wound had entirely healed up, all the urine being naturally voided, and the animal was discharged from hospital on December 23rd. The fragments of the calculus, when collected, weighed 10 oz. 3 dr., but at least 3 oz. more must have been lost in the washing-out process, making the weight of the stone, when entire, about 13 oz. Without the assistance of Messrs. Hagger and Pease, it would have been impossible to have performed the operation with the defective instruments that were necessarily employed.

NATIONAL AND INTERNATIONAL MEAT INSPECTION.*

BY OLOF SCHWARTZKOPFF, V.S., U.S.A.

No occurrence in the history of the United States has had more significant relation to the veterinary profession of the country than the repeated endeavours of the legislatures of several States to make meat inspection laws. Although these State laws have proved inefficient, and have not been sustained, it is not because the principle of such laws is wrong, but because the sanitary principles involved have not been sufficiently comprehended and guarded. Still, the movement in this direction has awakened great public interest, especially among agriculturists. In consequence, Congress has passed a Bill providing for an inspection of meats for exportation into foreign countries. While this law is only one step in the right direction, it will, if carried out, benefit the stock-raising farmer of this country, and will also advance the cause of the veterinary profession of the United States, a feature which was least thought of by most of our national legislators.

Under these circumstances, then, it becomes us to use this occasion to discuss the principles which should govern sanitary meat-inspection laws both at home and abroad.

In dealing with the subject I will not enter into the history of meat inspection, but only remark that it is not at all a modern idea, as stated by some newspapers and agricultural journals. In ancient times it was, of course, a religious rite, while it now belongs to sanitary science. Nor will I refer to the literature on the subject, which is quite comprehensive in some European languages. But I shall step at once into the proper theme and ask the following questions :—

I. Is meat inspection necessary, and is it a sanitary measure ?

II. What meat shall be regarded as wholesome for human food, and what as unwholesome ?

III. How shall meat inspection be carried out ?

I. The history of medicine tells us emphatically that there exists an intimate relation between our health and our use of animal food. It is an established physiological fact that an albuminous diet gives the human organism greater energy. While thus wholesome, meat may be regarded as of the greatest importance from the standpoint of national economy and also as one of those indirect civilising powers, yet, meat from diseased animals brings forth many and dreadful dangers to society. Not only may we become temporarily sick by eating flesh of animals which were suffering,

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for instance, from a disease accompanied by high fever, and through the meat acquire those more or less injurious animal parasites such as tape-worms and hydatids of the lungs and liver; but even life may be directly menaced with danger from the use of trichinous pork, or meat from tuberculous cattle or hogs, or from the most dangerous group of diseases in this direction—Septicæmia and Pyæmia.

But the general public can have no sufficient knowledge of these facts; it is impossible for the masses to acquire this particular knowledge in the other engagements of life. Individual self-protection seems impossible, consequently it falls upon the government, State or general, to provide a protection for our health and life alike in this direction, as is done in other matters of a sanitary nature. For this reason meat inspection becomes a sanitary precaution, demanding the attention of State and local boards of health.

II. In dealing with the question, "What meat shall be regarded as wholesome and what as unwholesome," I think it is essential that we should distinguish between inspection *ante-mortem* and *post-mortem*. I do not mean that we should separate these two inspections, for in all critical cases both are required for an intelligent decision. But in looking over the approved systems of veterinary police of the foremost European countries, we find that provision is made in most of them to directly forbid the consumption of meat of certain diseased animals. The reason for this action seems to be, first, that the use of meat in certain diseases is usually fatal; and, secondly, that if such meat be used the speedy extinction of certain infectious diseases is almost impossible.

Besides this, we know from statistics in meat inspection that in certain diseases the meat undergoes during life such alteration as to render it, without question, unfit for human food. In these cases we should not allow the regular slaughtering of the animals under any circumstances, but see that the carcasses are effectually destroyed. In other diseases the examination of the living animal, combined with *post-mortem* inspection, is necessary to enable us to properly decide whether the flesh may be used for human food or for industrial purposes only, or should be totally destroyed. Still, there remains a great variety of diseases in which the determination of the wholesomeness of the meat depends entirely upon an examination *post-mortem*. So large is the number of these diseases, that some veterinary officers of the great public slaughter-houses count them as being about 90 per cent. in the common routine of business.

With these points in view, I will undertake to make a classifi-

cation of the diseases demanding special attention in the practice of meat inspection.

I.—Diseases in which animals should be condemned, killed, and the carcasses effectually destroyed.

(1) Anthrax. (2) Rabies. (3) Septicæmia. (4) Cattle Plague. (5) Glanders. (6) Small-pox in sheep. (7) Swine Plague and Hog Cholera. (8) Unborn animals.

II.—Diseases in which slaughtering may be permitted to ascertain whether the whole or part of the meat is fit for human food or be used for industrial purposes or be destroyed.

(1) Foot-and-Mouth diseases. (2) Tuberculosis in cattle, hogs and chickens. (3) Actinomycosis in cattle. (4) Icterus. (5) Milk Fever in cows. (6) Hydrathorax and ascites. (7) All diseases which are combined with high fever, general emaciation and debility; for instance, Pneumonia, Enteritis, Uteritis, etc. (8) Overheated and too young animals which should be kept for a further examination.

III.—Diseases ascertainable only after slaughter, and in most cases by the use of the microscope.

(1) Parasitic diseases of meat: Cysticercus cellulosæ in hog and deer; Cyst. c. tænia med. in cattle; Trichinosis of hogs; Actinomycosis of hogs; Sporospermia and muscle distoma of hogs. (2) Parasitic diseases of those organs which are used as human food: Brain, heart, lungs, liver, kidneys and intestines.

(*a*) Brain: Coenurus cerebralis in cattle.

(*b*) Heart: The different Cysticerci.

(*c*) Lungs: Strongylus micrurus in cattle; strongylus filaria in sheep; strongylus ovis-pulmonalis in sheep; strongylus paradoxus in swine; echinococcus.

(*d*) Liver: Cysticercus tenuicollis; echinococcus; distoma hepaticum.

(*e*) Kidneys.

(*f*) Intestines: Tape-worms and other intestinal worms that can be easily removed by turning the intestines and cleaning them with water.

This tabulation of diseases may serve for general purposes until through further scientific research certain diseases are better understood. Also, it is sufficient, as long as we limit ourselves strictly to the question whether meat is wholesome or unwholesome for human food. But it is sometimes asked if certain

meat is of a proper nutritious quality? This raises another question, whether such jurisdiction belongs to veterinary science at all. It is probable that if meat inspection should become developed in this direction the chemist will be the proper man to decide. But if we pursue meat inspection within the limits of veterinary science, we are strictly in our line of work, and will come across very few difficulties. Still there occur cases which will not fit into the classification as suggested above, neither can any classification or direction as yet be made that will be a complete guide in all cases. From this reason alone, if not from others, it is obvious that only qualified veterinarians should be employed for this sanitary work; men who will decide such cases according to their knowledge of pathology, men to whose sphere of knowledge and judgment the whole question naturally belongs. And this will lead us to question

III. "How shall meat inspection be carried out?"

The practicability of a systematic inspection of meat and the efficient control of the meat supply requires:

(1) Proper legislation to regulate the inspection and supply of meat. (2) The erection of public abattoirs. (3) Men of special scientific training to act as inspectors.

Without these provisions combined, any attempt at meat inspection will have very little value as a sanitary measure. We have witnessed the enactment of the so-called meat-inspection law in the States of Indiana, Minnesota, Colorado and the Territory of New Mexico. These laws were called meat inspection laws, while they provided only for an inspection of the living animal in the stockyards, which consisted mainly in a superficial glance at the animals by the inspector from a distant point, condemning certain animals bearing conspicuous, but often harmless, blemishes, and overlooking others affected by dangerous maladies. On the whole, the performance amounted merely to a counting of the animals for the legal fee per head. I will read you an account of such inspection from a newspaper slip.

After discussing the enactment of the law, the reporter writes:

"The inspector can inspect 1,200 hogs and 600 cattle a day without trouble. How does he do it? The inspector, be it known, doesn't feel any pulse, look at any tongues, apply the stethoscope or go through any hoodoo incantations in determining the health of the steer, hog, sheep or calf. He just sizes the animal up, and if there is anything wrong he will see it instantly. In the case of cattle, which it is known are on the market for slaughter, he looks them over when they are weighed. It is also at the scales that all sheep and hogs are inspected. As they are driven on the scales they are counted, and again as the gates are

opened and they troop off. The inspector stands up on the fence and if he sees a hog that does not wriggle about as though he felt tip-top, he is singled out and rejected. This is how animals, whose flesh is intended for human food, are inspected under the new law."

It does not need any comment on our part to show the absurdity of such inspection. But it works injury to the public, who believe that they are now protected from diseased meat and that no change of such law is needed. The butcher and stock dealer rather favour such inspection, as it does not cause them any loss or inconvenience. But we meet with the most vigorous opposition on the part of these very men when we declare the necessity of inspecting the slaughter-house and the process of slaughtering and dressing. This they regard as an encroachment upon their private affairs. We may go all over the country and we will find that the entrance into the slaughter-house is not usually allowed, and we should not blame the butcher for this, for the slaughter-house is his sanctum sanctorum. Here he polishes his meat and makes the most of those manipulations which prepare the meat for the store. While it does not necessarily follow that anything wrong is done, and while I am personally convinced from years of official intercourse with butchers that in the main they are honest men, still there are some of them who are not so honest, and who will use without scruple diseased meat, even if they know it to be dangerous. In the slaughter-house, then, is just the place for the sanitarian to enter into a careful inspection; here he may often detect numerous pathological conditions which he never could have found in the living animal.

But even this is not the ultimatum of inspection; to accomplish our full purpose, we have to follow the meat into the store and direct such arrangements for its handling and storage as may be demanded by hygienic precaution, and especially in seasons favourable to the development of micro-organism. To do this, and to do it efficiently, we need such laws as will recognize and meet the emergencies just mentioned. While there must necessarily be left a certain liberty as to the decision of the sanitary officer, it is desirable that he have, as a basis for his action, well-defined law, which can be understood alike by him and the butcher and stock dealer. Such law is not only essential for the execution of meat inspection, but it will also save the butcher and the sanitary officer needless dispute and misunderstanding. The more elaborate such law is formulated the better it will work. It must define in unmistakable terms the duties of the sanitary officer and the butcher. And above all,

such law needs the advice of scientists as well as of the lawyer. It is one of our foremost duties to watch the development of these new laws, to instruct the public about the proper principles involved, and to use such professional influence upon legislators as to produce an efficient law. If this is done quietly but persistently, we cannot fail to produce much good.

The question for us to consider now is, where can meat inspection be carried out? Whoever has had the chance of visiting a slaughter-house, such as are found scattered all over the land, in city or country, must have felt disgusted at the prevalent condition of such places. Not to speak of the total absence of any hygienic arrangements, the unclean manner in which they are kept makes them a horror. Gentlemen, I feel sure that no meat inspection is possible nor advisable in such places; we cannot be expected to perform our duty in blood and dirt up to our ankles. If civilization should be extended anywhere it is into the slaughter-house. But looking at this matter as leniently as possible, it remains a duty to condemn these places and to demand the erection of public abattoirs by the community. No expense is too large, no sacrifice too heavy, to accomplish this end. The plan, location and erection of such public abattoirs should not be decided upon without the advice of a sanitarian, and an architect who can properly apply the principles of hygiene to such buildings.

As to the question, "Who should be recognized as the proper expert in meat inspection?" there can be but one answer, namely, the veterinarian. To successfully perform both *ante-mortem* and *post-mortem* inspection requires a thorough knowledge of physiology and pathology of our domestic animals and their relation to the human race. As the physician is too much of a specialist to be compelled to pursue these studies, the other medical profession should consider them. This is specially proper, since every educated veterinarian diligently follows the discoveries of medical science, whereas the physician is largely ignorant of what is going on in veterinary science.

To employ laymen as meat inspectors, such as stockmen and butchers, is a great mistake. I know from personal observation that such men will decide according to their feelings and prejudice rather than from knowledge. If asked why they condemn such and such meat, they will say, "I would not eat such flesh." The argument of some authorities on the employment of laymen is, that many veterinarians do not know more about it than these men. Now, that is erroneous. We may candidly admit that many veterinarians of this country are not up to a high standard of education; but however little they may have gained at college, they have gone through a systematic course which will at least

enable them to know why they do so and why not otherwise; and, may I ask, is there any profession in the United States which has a uniform standard of education? Is there not the same difference of general and professional accomplishments in physicians, lawyers and ministers? Still, however great may be at present the perplexity about everything belonging to meat inspection in the heads of some of our legislators and their followers, we feel sure that the whole question will solve itself in time on its natural basis, and that the veterinarian of the United States will duly occupy the same position as a sanitarian that he effectually holds in European lands.

Having discussed the principles of meat inspection, it is not difficult to apply them to national or international legislation. In the United States there seems to be the tendency to deny the right of a single State to enact laws requiring meat inspection within its own limits, as this naturally restricts inter-State commerce. It seems, then, as if the national government is the proper authority to carry out such laws. It does not matter much, from our professional standpoint, whether the national government or the States pass such laws. But if there be no uniform law otherwise, we should unite our influence in behalf of the interested public, to secure a national law which carries with it so much more authority and efficiency. It is to be deeply regretted that the bill recently introduced into the Senate by Senator Paddock, providing for national inspection of both cattle and hogs and their products intended for transportation from one State or Territory to another and for foreign exportation, has not been passed by Congress. This bill, with the exception of a very few points, was well adapted to serve the purpose, and would have been a judicious move. The failure of this bill to pass leaves us still without a national inspection law. Still, necessity will demand this or a similar measure in the near future.

There is an increasing disposition on the part of our legislators to promote the exportation of meat. That this can be accomplished only when we have a proper inspection throughout our country, and one which foreign nations can accept as adequate, is evident to anyone familiar with the strict meat inspection laws of European countries.

Possibly, if meat inspection is brought into international negotiations, it may undergo some slight alterations, but its principles will stand, and we will have to adopt them.

The Edmunds Bill, which just passed Congress, provides for the inspection of salt pork for exportation. I give you Section 1 of this bill:

"AN ACT providing for the inspection of meats for exportation, prohibiting the importation of adulterated articles of food and drink, and authorising the President to make proclamation in certain cases, and for other purposes.

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That the Secretary of Agriculture may cause to be made a careful inspection of salted pork and bacon intended for exportation, with a view of determining whether the same is wholesome, sound and fit for human food, whenever the laws, regulations or orders of the government of any foreign country to which such pork or bacon is to be exported shall require inspection thereof relating to the importation thereof into such country, and also whenever any buyer, seller or exporter of such meats intended for exportation shall request the inspection thereof."

This is the text referring to meat inspection, and then follow nine long sections prohibiting the importation of adulterated food and drink. While this may be evidently very necessary, it has no direct logical connection whatever with a meat inspection law, and will look very suspicious in the eyes of the unprejudiced foreigner. But, to come back to the section read, is it not a mockery on what has just been stated at length? This alleged inspection of salt pork can only have reference to microscopical inspection, and you know with me that it is a most hopeless task to attempt such inspection. From the process of curing with salt the meat becomes so hard and rough that it is difficult, almost impossible, to prepare it for microscopical examination. Such methods are of very little value; indeed, for a careful microscopical examination, it is useless.

How then, can we expect, under such a law, that the foreign restrictions will be withdrawn? And if exportation should be attempted under such circumstances, what will be the result? Undoubtedly a second inspection on the part of foreign countries, which will add this expense to the price of the pork. The poor classes in several European countries are anxious to buy American pork, but will not be able to do so if the pork is not cheaper than that of the home country. This must reduce our export trade almost to nothing.

The European countries which import American pork are Germany, France, Norway and Sweden, Denmark, and Italy. All these countries have at present restrictions against American pork. All these restrictions are based on sanitary grounds. Whether correctly or not I will not here undertake to discuss. Now, what change can we reasonably expect to result from the Edmunds law?

In closing my paper, I wish to appeal to your continued interest in the questions just discussed, and I especially appeal to the deans of the veterinary colleges of this country to provide for separate lectures on meat inspection, with practical exercises in public abattoirs; that if called upon we may have men able to undertake the responsibility that is connected with this sanitary measure. There can be no question that we shall witness some important legislation in regard to meat inspection in the coming years, and it should be our professional pride to intelligently advise our legislators as to the proper scientific standpoint of such laws.

As veterinarians, we are doubly interested in this question. It concerns us as members of the general public, but to a much greater degree does it interest us as members of the veterinary science, to which it gives great opportunities and adds great responsibilities.

PHYSOSTIGMINUM AS A THERAPEUTIC AGENT IN IMPACTION OF THE BOWELS.

BY HENRY C. REEKS, PUPIL, SPALDING.

READING in the different journals, and hearing from time to time of the many contrary opinions as to the reputed therapeutic action of this drug, I beg to be allowed to mention two cases received into our infirmary during the last fortnight.

Case 1.—A light cart-mare (ten years old) was admitted about 7 a.m., apparently suffering from impaction of one of the large intestines, accompanied by a great deal of tympany.

Pulse about 55, respiration a little hurried; and, on being turned into the box, the mare showed all the usual symptoms of severe abdominal pain, and was evidently suffering a great deal. On applying the ear to the abdomen, however, not the slightest murmur of the intestines could be heard.

The usual remedies were at once resorted to, viz., a 7-drachm purging-ball, and a drench consisting of Spt. Ammon. Ar. ij f ʒ and Spt. Ætheris Nit. ij f ʒ. The animal, however, gaining no ease all day, and the pain obviously increasing, about 5 p.m. a full dose of Physostigminum ij f ʒ (Hewlett's) was injected into the jugular vein. After an interval of about twenty minutes the animal showed evident signs of uneasiness—walking round the box, anxiously looking towards its flank, and pawing from time to time with the fore feet.

Respiration now became very hurried, pulse being about 70; there were frequent and profuse escapes of gas (per anus), and, on auscultation, the murmur of the intestines could now be plainly heard. At last, after much groaning and frequent attempts, a

quantity of hard fæces was expelled, and from half an hour to an hour after the injection frequent evacuations of fæces took place at intervals of a few minutes, each becoming softer and softer, until the animal appeared as though it were suffering from the effects of an overdose of physic. These symptoms, however, gradually subsided, and left the patient free from all abdominal pain whatever. The animal, I must add, was in a state of extreme exhaustion, but perfectly quiet, endeavouring to pick a little hay and eat a few mouthfuls of corn.

During the next day the mare appeared to be much nauseated by the drug, and a great deal of fever was noticeable, but all these symptoms gradually disappeared, and in three days she was discharged cured.

This case is the more remarkable from the fact that the mare was punctured four times (twice each side) to allow the escape of gas.

Case 2.—A heavy cart-horse, which exhibited every symptom that the above did, having been affected more or less all day, was brought to the infirmary about 8 p.m.

A dose of physic was administered and the drench, as in the previous case; but without waiting for the action of the medicine, a full dose of Physostigminum was injected intravenously, and within twenty minutes all the symptoms as mentioned in the preceding case were noticed, but in a more marked degree. After about an hour and a half the horse was free from any appearance of pain, but greatly exhausted.

My father says he has noticed that in all cases where he has used this drug it leaves the patient greatly prostrated, with an increased temperature, and more or less irritable condition of the bowels for a few days.

These two cases are not of an exceptional character, but in all cases of impaction where this drug is used previous to any signs of Inflammation, it is almost certain to bring about a favourable change; and my father assures me that during the time he has used it (now five or six years), it has nearly always brought about the desired effect.

SCIENTIFIC HORSE-SHOEING.

BY WILLIAMSON BRYDEN, VETERINARY SURGEON, BOSTON, U.S.A.

In a recent number of The Veterinary Journal I noticed with much satisfaction that in May last "a successful meeting was held at the Mansion House, London, under the auspices of the Worshipful Company of Farriers, for the purpose of promoting the scheme for better technical instruction among farriers, or shoeing-smiths," etc., and since then that this had been accomplished on Lord

Mayor's Day, through the influence of the Royal College of Veterinary Surgeons, the Royal Agricultural Society, and the Worshipful Company of Farriers.

The demand for this movement was never greater than it is now. It applies to America as well as to Great Britain, and the step has been taken none too soon, if the shoeing, management, and treatment of the locomotive organs of the horse are to keep pace with the progress made in other departments of medical and veterinary science.

No matter how veterinarians try to console themselves that it is demanded principally because of the increase in value and numbers of our horse population, the fact remains there is another most important reason—the backwardness of the art of horse-shoeing. In candour and fairness, the blame cannot be all laid to the shoeing-smith, handicapped as he always has been by the whims of owners, or those in charge, and by veterinary surgeons too, who, it must be admitted, assume an authority in such matters not warranted by their studies of the technical work of horse-shoeing or the more comprehensive subject of animal locomotion. What could be learned from listening to lectures treating in a general way of old theories based upon imperfect notions of the relation between the feet and the limbs, or to rules and methods for shoeing, management, and treatment, based on data so crude and empirical that their origin could have been nothing more than traditional usage of the most unreliable and mysterious character?

One of the most significant features connected with this movement is the dignity that will be given to what has been considered a rather humble subject, through the eminent character of the organisations endorsing it. This patronage will also be accepted as a guarantee that it will be progressive—that the present competitions, which, if I understand them, appear to be nothing more than athletic tests, all right for apprentices, but of little value in determining how much the competitors know about the character of the horse's foot and leg and the kind of shoe required.

The fact is, our horse-shoers are not generally far behind in mechanical skill, so far as making, creasing, punching, clipping, and calking a shoe are concerned. It is rather in the preparation of the hoof, and the selection of different forms and weights of shoes, to fit different kinds of feet, to overcome erratic gaits and defective action, to correct conditions of the hoof that lead to diseases peculiar to the limbs of horses, or that interfere with or influences its own growth in an undesirable direction. The time is passed when our clients are satisfied to let their horses feet alone rather than run the risk of cutting or rasping them, in order to overcome want of tear and wear or irregular growth. There is a right way and a wrong way of doing this. It is humiliating to the profession

when they are unable to give better advice than, "on no account allow the frog or bars to be cut, or the sole thinned out," or to rely on "getting frog-pressure." Such favourite old maxims have done as much harm as good, and even more. If the cutting is done properly, the animal will be benefited; if improperly, it will be no worse than what would result from neglecting to cut when necessary. The scientific man knows when to cut and when not to cut; where to cut and how to cut. It is the unscientific man who is influenced by old maxims, because he fears a blunder in operating, that is creditable neither to his courage nor his skill.

As an example of what horse-shoers require to know and be able to explain, in these competitions in the higher technical education, let me take the liberty to suggest the following examination in equine orthopædics.

Why do horses toe in or out with one or both feet? What changes have taken place? What are the causes of these changes? What are the causes of interfering at the knee, cannon, ankle, and coronet? When is it due to placing one foot too much in front of the other? When is it due to a twist in advancing the foot, and why? Why is the foot lifted higher in one case than in others? What are the structural changes and what the functional? What causes paddling, and how correct it by shoeing? Again, what causes over-reaching? Does he dwell too long on his forefoot? If so, why? Or is he unable to stretch back his hind foot far enough, and so has to throw it too far forward? If so, why? In such cases does the form of the hind hoof compromise the lower articulation, or is the limb muscled too heavily in front? Is the cause of Springhalt periphral or central? When there is inharmonious organisation of the limb, what are the structural changes in different forms of Springhalt? When there is disturbed function only, what is the prospect of being benefited by treating the hoof and shoeing? What is the character of the foot that leads to Springhalt? How should a pacer be shod to make him trot? How determine the weight of his forward shoes? When should a toe calk be set back on the web of the shoe? When should a four-calked shoe be used? When should the inner toe calk be set further back than the outer, and *vice versa?* When are two side clips necessary? When should the bar be cut? What is the character of the feet and limbs associated with a low head and roach back, or with a high head and hollow back? Explain the selection, driving, and clinching of nails. Describe the character of the hoof liable to toe crack, quarter crack, crack between toe and quarter, heel crack, broken bar, outside quarter crack, and the treatment by shoeing. When should the frog be trimmed?

When should the outside wall be thinned at the heels or elsewhere? When is frog-pressure necessary, and when not? Why does a horse hitch behind, and how correct it by treating the foot and shoeing? Differentiate between hereditary, or natural, and acquired defects. Describe the following defective conditions of the hoofs and ankles, and explain treatment by shoeing of cockled ankles, too straight, too low, too far back of foot, too much over inside heel or outside heel. Describe heels that spread when weight is thrown on them and those that narrow. Describe stumbling and tripping, and correct by shoeing, etc., etc.

These are only a few examples of what the horse-shoer should be able to explain. When we add to this a classification of the hoofs showing those that predispose to and are peculiar to those diseases to which the horse's limbs are subject, a field of study of the very highest scientific interest is opened up, and one that has never been comprehensively explored.

It appears to me fortunate that the Royal College of Veterinary Surgeons has taken so much interest in this "scheme," in spite of the opposition; for had it been otherwise, independent schools would have been started that might possibly have led to friction and antagonisms between the veterinarians and farriers, where now such a thing need be no more likely to happen than between the oculist and the optician.

HYSTERORRHAPHY, OR VENTRAL FIXATION OF THE UTERUS, FOR THE CURE OF INVERSION OF THAT ORGAN IN THE BITCH.*

BY JOHN WENDE, V.S., BUFFALO, NEW YORK.

On October 24th, 1890, I was called to attend a Newfoundland bitch, eleven months old, said to have a large swelling under her tail. Upon examination I found the uterus inverted, the tumour being about the size of two fists, covered with pus, and emitting an offensive odour. The hairs of the tail and hind legs were matted together, making the animal a very loathsome object.

The owner told me that the bitch had come into heat about three weeks previously, and she, being young, and never having been bred before, he decided not to stint her to a dog until the latter part of the œstrum. On the sixth or seventh day he noticed her straining, and also the appearance of the tumour in the vulva. She continued her expulsive efforts, and in twenty-four hours the protruding organ had increased to the size of a man's fist. He then consulted an empiric, who prescribed a powder to

* A paper read before the Veterinary Medical Association of Ontario at the Annual Meeting at Toronto, December 19th.

be given internally, and ordered the parts to be swabbed with equal parts of warm water and milk several times daily. He also cautioned the owner not to touch the organ with his hands, as it might produce "blood poisoning" to both animal and man.

After employing the prescribed treatment for two weeks, during which time the dog assumed the appearance above described, the owner was advised to consult me. I had her brought to my infirmary, and with the assistance of my pupil, R. H. McMullen, washed the parts thoroughly, placed her on a table, put her under the influence of ether, removed all crusts from the mass, and by continued pressure for one hour, succeeded in returning the protruding viscus to its natural position. We then stitched up the vulva with four interrupted sutures of linen tape, fed the patient on a laxative diet, and washed the parts twice daily, using a syringe and antiseptic and astringent lotions, composed of water, boracic acid, alum and sulphate of zinc alternately. This treatment was continued for one week without any apparent improvement, as the organ persisted in resting against the stitches in the vulva, even if it were placed into position with a pessary a dozen times daily.

I then decided on the above-named operation, which has been successfully performed on human subjects, for the details of which I would refer the reader to two articles by Howard Kelly, of Philadelphia. The first in the *American Journal of Obstetrics, vol. xx., Jan.*, 1887, and the second in the *American Journal of the Medical Sciences, May*, 1888. Also to one by Sänger on *Operative treatment of Retroversis-flexis Uteri* in the *Centralblatt für Gynäcologie, Nos. 2 and* 3, 1888. It was as follows:—I again placed the bitch on the table under ether, shaved the hair from the posterior part of the abdomen, made an incision about five inches long on the linea alba between the last four teats, passed my hand into the abdomen, grasped the uterus, and by gentle traction drew it forward into position, and fastened it about one inch above the incision with three interrupted stitches of strong catgut. In inserting the needle, I aimed to grasp about one third of the body of the uterus, and quite deeply into the muscles of the abdominal wall. I sponged out the abdomen with a weak solution of boracic acid, sutured the muscles with catgut, the common integument with linen thread, removed the stitches from the vulva, the muzzle from the nose, dashed a little cold water on the head and chest of the patient, and in a few moments she stood up, apparently none the worse from the effects of the ordeal. On Nov. 6th, seven days after the operation, I removed the stitches from the skin and sent the dog home all right, with the exception of the wound on the abdomen, which was about three inches long, and that she evinced

pain whenever she tried to sit down upon her haunches for three weeks after the operation. But this trouble has gradually worn off, and at present she is as well as ever.

THE EXAMINATION OF HORSES AS TO SOUNDNESS.*

BY J. D. O'NEIL, V.S., LONDON, ONTARIO.

THE subject-matter of my paper which I beg to bring before—as this evening, is that of examination of horses as to soundnes you subject of the greatest importance to us as veterinarians and to the community of horse owners at large, and one which, during all past years, has been the cause of much difference of opinion and of contention amongst members of our profession and some of our most eminent authorities.

To young practitioners about to enter upon their professional career, or those who have just entered upon it, the subject is always one of interest, for no other test seems to equal that of examining an animal as to soundness, under, may be, critical eyes, to a young man with the prospect of world-famed failure if he does wrong, and of no world-famed applause if he diagnoses aright. To older practitioners, and those of great experience, and so accustomed to conducting examinations as to soundness that it comes as child's play, my paper may come as uninteresting; but I wish to dictate to no one—simply to set forward a few of my thoughts on this great subject and to hear the opinions of others.

The first thing we must decide amongst ourselves is that of what is to be defined as unsoundness. I take unsoundness to be "That condition of abnormality of an organ or organs in any part of the animal structure which interferes with the proper performance of function or functions, or at any time may be liable to cause an interference of same, or to cause an unfitness to perform the purpose for which the animal was intended, and consequently depreciates and lessens the value of the animal under examination."

Now, having decided what unsoundness is, how are we to find it out? *My* method of examination as to soundness is as follows:—

The animal should be taken from its stall or box by an assistant, and immediately brought to the light, where the eyes should be examined closely, and for which various means are used, such as shades, the hand, hat, and the catoptric test in a darkened stall. Coming to the light causes the pupils to contract in a healthy subject; in many affections of the eyes the pupillary opening remains oval and dilated in appearance, which denotes disease of

* Read at the annual meeting of the Ontario Veterinary Medical Association, Dec. 19th.

the organ. The animal being on a level place, the assistant standing on the near side in front, the veterinarian should proceed to examine the nostrils for polypi, healthy appearance, and absence of signs of disease. Then examine the mouth—first the teeth as to age, disease, supernumerary, irregular, or removed ones, crib-biting, wind-sucking, etc., etc.; then the tongue for laceration, Paralysis, protrusion, etc.; then the lips for laceration, Paralysis, etc. Passing the hand under the inferior maxilla and quietly taking the pulse, we examine the submaxillary glands for disease, enlargement, induration, or adhesion to surrounding structures; then the parotid duct for calculi, enlargements, Fistula, etc.; then the ear—passing the finger inside (feeling for tumour); then the poll (occipital crest) for Poll-evil and other disease. I now pass my fingers over the jugular vein (raising the vein) to see if obliteration of it has taken place (the result of disease); then examine the withers for disease (Fistula) or signs of former disease having existed. Then examine the muscles of the shoulder for Shoulder-slip, the spine of the scapula, and the shoulder joint. I then pass the *right hand* down the fore leg, *in front*, examining the knee (Broken Knee), the metacarpals (for Splints), passing down to the fetlock for bursal enlargements, deep-seated Windgalls, etc.; the pastern for Ring-bone; then the coronary band for Treads, Quitter, Sand-crack, etc.; then with the *left hand* examine the elbow joint for bursal enlargement, Anchylosis, etc.; the knee for Speedy-cut. Flex the knee to see if Anchylosis is present, by bringing the heel of the foot up to the elbow; then the back tendons and back part of the fetlock for Sesamoiditis, and then the lateral cartilages for ossification (Side-bone). Press with the left hand on the region of the scapula, and with the right hand raise the foot (near fore); examine for Thrush, Canker, Corns, Pumiced-foot, False-quarter, Quarter-crack, and for Seedy-toe (by tapping with a hammer), and the general appearance of the foot and wearing of the shoe. Then pass the left hand over the vertebral column with pressure as far as the croup, noting the absence or presence of wincing under the pressure; then pass the right hand under the abdomen; examine for Hernia, Warts, etc. Then stand about a pace from the shoulder, on the left or near side, and observe the hock for symmetry and conformation; then with the right hand externally, and the left internally, examine the stifle for Luxation, Dislocation, and bursal enlargements; then pass the right hand down to the hock, and examine the part by manipulation for Spavin and Thoroughpin. Then pass down the metatarsal bone to the fetlock; examine for bursal enlargements, conformation, etc.; then the pastern for Ring-bone, Side-bone, and continuing downwards, examine the foot for Sand-crack,

Quitter, etc. Then with the left hand elevate the tail; examine the ischial tuberosities, and see that they are parallel; the anus and perinæum, vulva (if a mare) and clitoris for Hermaphrodism, recto-vaginal Fistula, etc. Then pass the left hand down over the hock; examine for Capped-hock and Curb, passing down the metatarsal to the fetlock for Wind-gall and Sesamoiditis; then the pastern, lateral cartilages, as in fore extremity. Then press on the extangle of ilium with the left hand, and with the right elevate the foot, and examine for Thrush, False-quarter, etc., as in fore extremity. Then have the animal stand squarely on the ground or floor, and observe the formation of the hips and hind-quarters, and pass around to the other side (going in front of the subject), and proceed to examine the right (or off) side, in a similar manner. Then have the animal turned round in a small circle—first to the left, then to the right; then have him backed quickly and moved forward at once, observing the action of the hind legs and loins; then place a man on his back, and give him a smart gallop, stopping him quickly and listening to the respirations, noting any abnormality in the same. If you cannot find space for, or rider to gallop him, cause excitement otherwise, standing him up against a wall, and, holding him with the left hand, strike him with the right, and then attempt to strike him; at the same time give him a shake on the bridal or halter. The slightest grunt observed in an animal should be denounced, for if conditioned (highly fed) he will prove a roarer. Then have him walked straight away from you, and trotted back on the level hard road, and note his action, style, etc. If veterinary practitioners will always follow this same course in their examinations, they will make few errors.

Now, having given my definition of unsoundness, and description of my mode of examining for same, we are led up to the question of what really constitutes unsoundness; for on examination we may find blemishes which depreciate the animal in appearance, but not in usefulness, and in no sense could really be called an unsoundness. It is our duty to call our client's attention to the presence of the same, signifying at the same time their harmlessness. That which really constitutes unsoundness, I take it as any fault or departure from the healthy state that will come under my definition of unsoundness.

Many things that we would draw our client's attention to may not debar the animal from a useful and serviceable life, and he may be practically sound for all general purposes. We say he is "practically sound," and we *do not* reject the animal, the only result being that his value may be depreciated; for we *must not indiscriminately reject* every animal for any single defect we see

upon him. Many things have to be taken into consideration as to whether it is likely to permanently affect the animal—the sex, age, temperament, and nature of the work of the animal, and the extent, nature, and position of the defect under notice; but where we come across a case of undoubted unsoundness, and that which, in all probability, is likely to remain as such, and especially where such unsoundness is likely to be reproduced in other generations, *then must we reject with a firm hand.* We should endeavour all we can to put a stop to the transmission of hereditary unsoundness; and this brings us to another field (and my last for this evening)—a field where we have plenty of scope, for in the list of hereditary unsoundnesses I would include Ophthalmia, Cataract, Roaring, Whistling, Side-bone, Ring-bone, Navicular Disease, Spavin, Curb, Grease, and Shivering, and under some circumstances, Bog-Spavin, Thoroughpin, and other bursal enlargements, as Wind-galls, also Splints, weak or contracted feet, and Stringhalt. So in this formidable list we have plenty of room to exercise our judgment, and I doubt not that many differ upon it now. As in the past, it has always been a bone of contention.

Gentlemen, this finishes my paper this evening. I have merely brought before your notice a few of my thoughts in as brief and practical a manner as possible, written with a willing hand in spare moments by a working practitioner. I do not lay claim to it as a long and learned discourse, but trust that it has served its purpose, and that it will draw your attention to this important subject.

THE SHOEING OF HORSES IN INDIA; WITH REASONS FOR AND AGAINST ITS GENERAL ADOPTION.

BY R. W. BURKE, F.R.C.V.S., A.V.D., AMBALLA, INDIA.

THERE were three batteries of Artillery that adopted an experimental trial requested in G.O.C.C. d., 23rd May, 1890, to institute an inquiry into the question of leaving off the hind shoes of detachment and riding-horses; and particularly into the practicability of the system, and the distribution of correct knowledge.

"C." Battery, Royal Horse Artillery, commenced leaving off the hind shoes of detachment and riding-horses on the 6th June, 1890. On the 27th of that month four detachment horses, noticed suffering from contusion (sole), were re-shod. This was sanctioned and recommended by the veterinary surgeon in charge; but on the 14th October, 1890, the hind shoes of all the horses in the above-named battery were re-applied by order of the officer commanding the battery, and without Departmental sanction.

"Q." Battery, Royal Horse Artillery, commenced leaving off the hind shoes of detachment and riding-horses between the 23rd

May and 1st June, 1890. It was found necessary to re-apply the hind shoes to two detachment horses about the 10th July, 1890—one on account of contused sole, the other for previous "bad feet." The veterinary surgeon was consulted in both the cases, and recommended the re-application.

65th Field Battery, Royal Artillery, Jullundur, commenced leaving off the hind shoes of detachment and riding-horses on the 1st June, 1890. There were no cases in which it was found necessary to re-apply the shoes.

It will be noted that the only instances in which it was found necessary to shoe the horses were in the case of lameness arising from accidental causes, or from previous malformation of the feet.

In settling this question for the Army, we shall probably have to recognise as a factor the difference arising from the greater or less work performed, and especially the nature of the ground traversed by the horses. The propriety of removing the shoes during the intervals of the year when any of the horses had no parade-work, as well as during the drill-season, by way of an experiment, was the subject of a report by me as early as 1884. Nevertheless, it was decided to remove the hind shoes of horses during the *non*-drill season only, and the fore ones not unless specially recommended by the veterinary surgeon in charge. It was believed that repression of "shoeing" in the Army would not at first be easy or trivial, although it was shown that in the great majority of cases no ill-results followed. Danger to the feet was apprehended. We may remark that no such interference with the feet of animals appeared to occur in Native Cavalry Regiments and Mountain Batteries in India, nor in Commissariat and private animals, as far as general experience was able to show. The danger alluded to, therefore, is imaginary rather than real.

The subject of removal of the hind shoes has been brought prominently before commanding officers of regiments. Few officers, next to members of our own profession, have more opportunity of seeing the need, and its extent, of shoes for Army horses, not only during the summer months and in the rains in India, but in the drill-season and winter. No doubt some reform is needed, for the end in view is not to shoe our horses for the sake of shoeing, but to maintain the feet of animals in a suitable condition to perform regular work. The subject will doubtless give rise to ample criticism, but our reasons for rejecting so much shoeing in the Service are economy and efficiency at all times. Towards a more immediate advantage may be mentioned improvement in the condition of the frog of the foot, which enlarges, while the heels expand, from normal pressure obtained by removal of the shoe, and there is less tendency to navicular disease promoted at the same time. The

nature of the ground is by no means such as to cause structural damage of the foot, and any destruction of the edges of its walls is easily prevented by a judicious use of the knife and rasp under veterinary supervision.

A FEW INTERESTING CASES.

BY J. LAITHWOOD, F.R.C.V.S., CONGLETON.

I. *Cæsarean Section.*—A small Russian poodle was brought to the surgery in an exhausted condition, after having been in labour over two days. On examination we could touch the ribs of the fœtus with the tip of our finger. The case was considered hopeless. However, I said we would practise gastro-hysterotomy. After removing the hair, opening the abdominal wall and uterus (patient was too much exhausted to require anæsthesia), four live pups and one dead one were extracted, along with their placental membranes. The abdominal wall was then sutured with carbolised catgut, and afterwards the skin well dressed with carbolic lotion and bandaged. The uterine walls were not sutured. The bitch made a good recovery, and is still living.

II. I was called to a sow that had been in labour for thirty hours. An empiric had been in attendance for the greater part of that time. I found the vagina and vulva swollen to such an extent that I could not introduce my hand; and the colour of the parts was as black as coal. I told the owner that I could not save the sow. I administered chloroform (not easily done in the pig), removed six live pigs and three dead ones. Then I stitched up the sow, as in the above case. The six live pigs were put to another sow that had only four living, and all did well.

III. *Colosomian Monstrosity.*—I was called to see a heifer (a primipara) that had been in labour since the previous day. Two empirics had been in attendance, and could make nothing of it. (I may here say that my district is blessed with no less than seven of these clever men, who, perhaps, do more harm to their unfortunate patients than to me.) The parts were much swollen, and all four feet and head of the fœtus were in the passage. After removing both fore legs, heart, and lungs, the head was corded and the calf born. The intestines were all loose, ribs and hind quarters turned over the back, exactly as represented in Fig. 104 of Fleming's "Veterinary Obstetrics" as occurring in a lamb.

IV. *Quintuple Pregnancy.*—On the 3rd of May last I was called to a well-bred Shorthorn cow, but arrived too late. The cow had eaten a quantity of cabbage, which caused Tympanitis. On *post-mortem* inspection I was surprised to find five well-grown calves—four bulls and one cow calf—all well nourished and about

three weeks from their proper time of birth. The calves all looked like living, if they had had the chance.

V. *Rupture of Flexor-Metatarsi.*—This occurred to a horse during the late slippery weather while frolicing about in a very hilly field. When the leg is lifted up, it attains the position exactly as shown in Fig. 49, Williams' "Surgery." I have fixed the limb in a plaster of Paris bandage, and will, I think, make a good cure.

VI. *Preventive or Protective Inoculation against Black Quarter.*—Professor Kitt, of Munich, has discovered that the dried, virulent muscle-powder, when exposed to the action of steam for five to six hours, forms an attenuated virus suitable for protective inoculation into the subcutaneous tissue behind the shoulder.

I operated on fifteen calves of my own on the 24th of last month, with lymph supplied to me and prepared according to the Kitt method. The whole of the animals were carefully examined previous to the operation, and were in perfect health. They were strong growing calves, and about nine months old. The instructions forwarded with the lymph were most strictly adhered to in every particular. On examination the following day the temperature of Nos. 2, 3, 8, 9, 12, 13, and 14 were raised, varying from $102\frac{4}{5}°$ to $103\frac{2}{5}°$ F. No other alteration, except in No. 14, which appeared dull, and the seat of injection was slightly swollen. The following day, December 26th, No. 14 was dead, and Nos. 9, 2, 8, 13 all more or less swollen at the seat of injection, with temperature ranging up to $106\frac{2}{5}°$, and pulse up to 120, with the miserable characteristic expression of the disease.

Nos. 2 and 13 were given frequently stimulants and antiseptics; the swollen parts were scarified, and fomented with hot water and acid carbolic. On the 27th I was unable to see them, but found on the 28th Nos. 2, 8, 9, and 13 all dead. The whole five had all the most decided symptoms of Black Quarter, and the *post-mortem* examination revealed the characteristic blackness and decomposition of the blood, with emphysema to a most marked degree. In all, the infection appeared to have spread from the point of injection. The remaining ten appeared all right until January 13th, when No. 7 died of Black Quarter, and on January 24th No. 11 died also of the same malady. This proves (as far as my experience is concerned) that Professor Kitt's method is not without risk, five out of fifteen dying over the operation. And also that it is not a protective method, as two have already died out of the ten that remained, and undoubtedly of Black Quarter.

The syringe used was a new one, specially made for the purpose, and capable of being sterilized in boiling water, which was done immediately before using it, and perfect cleanliness observed throughout.

RECOLLECTIONS OF PRACTICE OLD AND NEW.

BY W. COX, M.R.C.V.S., NEWCASTLE-ON-TYNE.

Pit Fever (Hectic).—I have recently had some cases amongst pit ponies that remind me of a similar affection that came under my notice years ago. The animals attacked were of various ages, and had been down the pit for a sufficient time for them to be inured to their work and surroundings.

The earliest sign was fickle appetite and, unless rested, a rapid loss of condition, and, as a rule, torpid bowels. No palpable signs of illness to ordinary observation—no cough, no alteration in respiration, but the temperature was increased from one to three degrees. Pulse quicker than normal, and feeble; continuous decrease of functional activity. In one or two instances there was occasional Diarrhœa with fœtor, and, at the finale, Diabetes, a remarkably tight skin, bright, anxious expression, and mouth hot and dry rather than soapy.

The malady hung on them for weeks, improving when entirely rested, but as bad as ever if worked again; in this way some were affected for six or seven weeks, losing condition, but whenever worked apparently willing and not unable.

It could not be attributed in any of the cases to exceptionally severe work, or to poor or insufficient food. Antipyrine and other fever agents were given, alteratives and tonics, and diffusible stimulants in extremity. The surest and most effectual method was to "draw" them to bank, lay them off work, and, if not too emaciated, the treatment mentioned was successful.

Influenza, Catarrhal Fever (Pink Eye).—The outbreak of this disease in 1881 was characterised by a *furore* that was unexampled, except as regards Cattle Plague. A local *confrère* or two were interviewed by a newspaper reporter, and the columns of more than one paper were crowded with alarming and sensational reports of "the new and deadly disease." It was publicly stated that it had been introduced into a local sale-yard in this city by Roumanian ponies, in the month of September. How far this could be correct, may be gathered when my ledger tells me that I attended animals (not foreigners) in the same yard suffering from the affection in the May previous, and prior to my visits several had died from the same cause.

Before we were well through the outbreak, a *confrère* read a thesis upon it—"The New Malady"—giving it the infelicitous name of "Epizootic Cellulitis, or Pink Eye." Those amongst us who had retained on the tablets of our memories the incidents o a long practice were aware that this was no new disease, but a

complication of Influenza of a type not general, and some of us could call to mind the outbreak of 1866, when it appeared first in the Metropolis, and was said to have been introduced from France. Hence the origin of the common name, "French Distemper."

It was very fatal and contagious, and spread quickly into the country, where the fatality was not so great. At that time I had a great number under treatment, and with identical symptoms to the 1881 outbreak.

At that time Mr. Lord, an Army V.S., in a monograph, termed it "Typhoid Mucosa"; whilst my brother, in an essay read before the S.V.M.A., gave it the name of Typhoid Influenza.

The symptoms, complications, and treatment are now pretty generally understood; nor would the losses be more than trivial could horse-owners be induced to follow out the dictates of common sense by relieving the animal *at once from all work*, by warm clothing, and effective ventilation. Almost every fatal case that has occurred to me has been through keeping horses at work until almost at a standstill. If prior organic disease exists, and the attack is severe, the prognosis is of course unfavourable.

As regards ventilation, some have an idea that a stable must of necessity be of a certain temperature, otherwise the occupants have a rough coat. One of 50° to 55°, with a pure atmosphere, is most desirable; it goes without the saying that this must be without draught. The evil consequences of this have, to my mind, received an illustration in a large establishment, where the loss, I hear, has been out of all proportion to the number attacked.

The ingress ventilation was from below, and through the stall-posts and directed upwards, but it was apparently forgotten that the rapid passage of fresh air through that surrounding it in the stable caused such agitation as to constitute a draught, and this impinging constantly on the animal, whether clothed or not, drove the current of blood to the lungs, and in all these cases there was a pneumonic complication.

For the double purpose of egress and ingress, I have constructed a ventilator having a self-closing division through the centre; the upper half is for the passage outwards of the impure and heated air, the lower half is for the ingress of cool air, and has a projection in front to throw it toward the ceiling. The diaphragm is opened by a cord, which passes through the bottom of the lip, and in windy weather it is necessary to rather more than half close it. The apparatus is very simple, and not liable to get out of order. I have patented it, and it is possible that I may yet make some little addition. I forward you a photograph.

DISEASE OF THE OVARIES AND LIVER.

BY CHARLES GOUNDRY, VETERINARY STUDENT, NEWCASTLE-ON-TYNE.

On the 27th July last we were called upon to visit a mare, nearly thoroughbred, and upwards of twenty years old, belonging to a man in this city. She was suffering from remittent abdominal pains, though not so acute as to disturb respiration, but the pulse and temperature were increased. The exhibition of pain was at irregular intervals, and had this peculiarity—that she cowered toward the ground, the hind legs being wide apart. The excretory functions were suspended. No cause could be assigned, either in feeding or work, for the attack. Medicinal agents were administered for the relief of the pain, and with these a dose of physic. The rectum was explored and fæces removed, and repeated injections given. The abdomen was also stimulated.

On the 28th and 29th the symptoms progressively increased in severity, especially the cowering, and no response was seen to the action of the physic, which had been further supplemented by the other treatment, as before mentioned.

She was seen on the 30th, evidently fast approaching dissolution.

On our visit on the morning of the 31st we saw, to our surprise, another member of the profession in front of us, evidently making for the same destination. On his arrival, without perceiving us, he said, in tones of commiseration, "Poor thing, I told you so, it would be Inflammation." He was evidently somewhat startled at my master's appearance, and on his asking him if he was aware of our having been in previous attendance, he said he was not. He at once told him it was not Inflammation, but some obscure organic disease—probably that of the ovaries—and this he had previously told the owner. We opened the mare, and found the most beautiful specimen it was possible to see of Nutmeg liver, evidently of old standing, as the viscus had decreased considerably in size. The dark mottled and yellowish-white appearances were such as are seldom seen. The kidneys were healthy. The right ovary was about twice the size of a cricket-ball, and filled with glairy fluid, the outer wall being tough and quite 1-16th of an inch thick. The left ovary was not quite half the size, and filled with a spongy mass, almost like broken-up muscle. The intestines were stained outside in longitudinal stripes of a light red colour. The inner coats of the stomach and intestines were quite normal, lungs hyperæmic, tissue sound, heart healthy.

The specimens were intended for preservation, but were accidentally destroyed. We may say that the mare had never been pregnant.

Editorial.

THE BRITISH INSTITUTE OF PREVENTIVE MEDICINE.

It is satisfactory to learn that steps are being actively taken to establish an Institute of Preventive Medicine in this country, having for its object the investigation of infectious diseases in mankind and animals, and especially the view of preventing or curing these by those means which are now attracting so much attention since Pasteur and Koch brought them into notice. England is certainly late in commencing such a movement, as Institutes of this kind are established in many countries—some of them insignificant in the matter of wealth and extent when compared with our own. How far the British public will respond to the appeal for funds to found such an Institute it is difficult to say, but certainly such a movement has the strongest claims to generous consideration, not only on humanitarian, but on economical grounds. To take one matter alone—it is something like a reproach to us that persons bitten by rabid or suspected dogs have to be sent to Paris for preventive treatment, merely because we are unable to provide it on this side of the Channel. Not only this, but in the investigation into the nature and causes of transmissible diseases we are left altogether behind by other nations, simply because we have no facilities like those found in the Institute Pasteur in Paris, though there are among us workers as enthusiastic and competent, in all probability, as are to be met with anywhere.

It is proposed that the new Institute shall be located at Cambridge, the Senate of the University there being very favourable to the project, and the sum estimated as necessary to place it on a good basis is over £100,000.

Matters with regard to it have progressed so far that all the formalities of Association have been completed, and these show that it is intended to have the Institute thoroughly representative. In this respect our readers will be gratified to know that the existence of the veterinary profession is not ignored, as is so frequently the case in similar matters.

Among the objects for which the Institute is to be established are the following: To provide instruction and education in preventive medicine to Medical Officers of Health, Medical Practitioners, Veterinary Surgeons, and advanced students; to prepare and supply special protective and curative materials as have already been found, or shall in future be found of value in the prevention and treatment of infective diseases; and to treat persons suffering or threatened with these. To effect these objects, laboratories will be provided, a scientific staff appointed, and lectures and demonstrations given.

The Institute will be governed by a Council of fifteen persons, and the following are named as the first members of Council :—

1. Sir Joseph Lister, Bart., F.R.S., F.R.C.S., D.C.L., LL.D., Surgeon Extraordinary to the Queen.
2. Sir Charles Cameron.
3. Sir Andrew Clarke, Bart., F.R.S., President of the Royal College of Physicians.
4. G. Fleming, Esq., C.B., LL.D., F.R.C.V.S.
5. Professor Michael Foster, F.R.S., F.R.C.S., LL.D., Professor of Physiology in the University of Cambridge.
6. Professor Greenfield, Professor of Pathology in the University of Edinburgh.
7. Ernest Hart, Esq., Editor of the *British Medical Journal*, Chairman of the National Health Society.
8. Professor Victor Horsley, F.R.S., F.R.C.S., Professor Superintendent of the Brown Institute.
9. Jonathan Hutchinson, Esq., F.R.S., F.R.C.S., LL.D., late President of the Royal College of Surgeons.
10. Sir James Paget, Bart., F.R.S., F.R.C.S., D.C.L., LL.D., M.D.
11. Sir Henry Roscoe, M.P., F.R.S., D.C.L., LL.D.
12. Professor Roy, M.D., F.R.S., Professor of Pathology in the University of Cambridge.
13. Dr. M. Armand Ruffer, M.A., B.S.
14. Professor Burdon Sanderson, F.R.S., Professor of Physiology in the University of Oxford.
15. Sir Jacob Wilson.

It is also arranged that vacancies shall be filled up by the bodies mentioned in the first column hereunder, so that each of such bodies shall have the nomination of the member of the Council to be elected in the place of the member whose name is set opposite to such body in the second column, or in the place of any successor of such last-mentioned member—at the Annual General Meetings three members retiring, but eligible for re-election.

1. Royal Society : Sir Joseph Lister, Bart.
2. Royal Irish Academy : Sir Charles Cameron.
3. Royal College of Physicians : Sir Andrew Clarke, Bart.
3. Royal College of Veterinary Surgeons : G. Fleming, Esq., C.B.
5. University of Cambridge : Professor Michael Foster.
6. University of Edinburgh : Professor Greenfield.
7. British Medical Association : Ernest Hart, Esq.
8. Members of the Institute : Professor Victor Horsley.
9. Royal College of Surgeons : Professor Hutchinson.
10. University of London : Sir James Paget, Bart.
11. Victoria University : Sir Henry Roscoe
12. University of Cambridge : Professor Roy.
13. Members of the Institute : Dr. M. Armand Ruffer.
14. University of Oxford : Professor Burdon Sanderson.
15. Royal Agricultural Society : Sir Jacob Wilson.

It will be seen from the foregoing that the Institute is founded on a wide and thoroughly representative basis, and though in other countries it would be started and maintained by Government, yet in England,

where pretty well everything is left to private or semi-private enterprise, it will have to depend upon the generosity and patriotism of individuals to make it a success, so far as money is concerned. As to its being a scientific success, there cannot be a reasonable doubt, and the nation will therefore reap the advantage in the increased health of its human and animal populations, while it will put our pathologists and bacteriologists on an equal footing with the co-workers of Pasteur and Koch, so far as facilities for research are necessary.

The movement in favour of the establishment of such an Institute is one in which the veterinary profession should be largely interested ; as if it succeeds, those members of the profession who desire to pursue their pathological and biological studies beyond the point at which they left them off at the Veterinary Schools, will find in the laboratories and the teachers of the Institute all that they require to aid them in the acquirement of knowledge in the comparatively new and almost unexplored region of medicine which holds out so much in the way of expectation and reward.

It may be remarked with regard to the fatuous agitation got up by a few individuals against Examiners being also Members of Council of the Royal College of Veterinary Surgeons, that the Constitution of the British Institute of Protective Medicine expressly sanctions and provides for such dual appointments, and in this it is following the general rule observed by similar bodies. In one of the articles of this Constitution we find it stated that, " Provided nothing herein contained shall prevent any payment...or of remuneration to any professor, lecturer, director, officer, or servant of the Institute, or to any member or other person in anywise howsoever connected with the Institute in return for any services actually rendered to the Institute, or undertaken by the authority of the Council to promote the objects of the Institute." In this the founders are not only following an ordinary precedent, but the dictates of wisdom and prudence.

KOCH'S TUBERCULIN AND TUBERCULOSIS IN CATTLE.

THE veterinary profession in Europe does not appear to have become so excited and expectant with regard to Koch's remedy for Tuberculosis, as medical men ; probably for the reason that the cure of this morbid condition in animals is much less to be desired than its prevention, and also from the fact that the medicament does not destroy the bacilli. But its use may be of some value in veterinary medicine as an aid to diagnosis, though how far it may be relied upon in this direction it is difficult to foretell, even in the case of man ; as instances are now beginning to be recorded in which its inoculation has produced no reaction in patients suffering from confirmed Tuberculosis, while it has done so in others affected with non-tubercular disease.

Last month a brief summary was given in this Journal of some experiments conducted by Dr. Gutmann, of the Veterinary School at Dorpat, with Tuberculin procured through the intervention of the Russian Ambassador at Berlin. Fuller details have come to hand, but they do not add much to the description already published.

Dr. Sticker, a German veterinary surgeon, records the results of his experi-

ments with the fluid upon tuberculosed cows. He found that fever manifests itself in eight or nine hours after the injection, the temperature ascending to 40° Cent., the pulse increasing to 110 beats per minute, and the respirations correspondingly hurried and laborious. In two instances the lungs became severely congested. Sticker speaks favourably of the fluid from a diagnostic point of view.

Delvos, another German veterinarian, in order to establish the existence of Tuberculosis in a Dutch cow, seven years old, on January 4th, at 9 a.m. injected behind the left shoulder two centigrammes of the fluid, diluted in 4 grammes of distilled water, the animal's temperature being at that time 38·4 Cent. During the day the temperature did not oscillate, and the cow ate its usual quantity of food at mid-day. At 10 p.m. the temperature was 39·3°; at midnight, 39·5°. On the following day at 9 a.m. it had fallen to 38·8°, and soon stood at normal—38·3°. At the same time a healthy cow, three years old, was injected with the same quantity of lymph, but the temperature remained after, as before the operation, at 38·4°. The material for further injection failed, but Delvos promises to publish the results of the autopsy of the diseased animal in *Berliner-thierarztliche Wochenschrift.*

At the meeting of the Paris Society of Practical Medicine, on January 8th, among the pathological specimens were shown portions of a cow affected with generalised Tuberculosis, which had received three injections of 5 milligrammes of Koch's fluid without exhibiting any reaction whatever. The cow was three years old, and weighed 260 kilogrammes. It had been taken possession of by the sanitary inspector of the Villette Cattle Market, and kept under observation from December 24th to January 7th, when it was killed. The symptoms were a slight, frequent, dry, abortive cough, and extreme emaciation indicative of Phthisis. The upper part of both lungs gave evidence of solidification, with sibilant and crepitant sounds in the middle portion of the left lung. The temperature was 39·4 Cent., respirations 36, and pulse 60. The lesions exhibited by the viscera were somewhat remarkable. The heart and blood-vessels—including the *aorta*—lungs, liver, spleen and kidneys, were all invaded by Tubercle. A lymphatic gland situated at the entrance to the chest, alone weighed 1,500 grammes, instead of 300. The udder, though apparently healthy during life, was also found to be invaded. The most interesting features in this case are: the great extension of the disease in so young an animal; the alteration in the prepectoral gland; and the aorta being involved in the disease—which has not been hitherto reported by any authority, according to the *Progrès Medicale*, in which an account of the case is given.

The Royal College of Veterinary Surgeons has now received a small supply of the Tuberculin from Berlin, which will be distributed to the four veterinary schools, to be experimented with, the results to be reported to the Royal College.

PROTECTIVE INOCULATION FOR ANTHRAX.

From Berlin it is reported that Mr. E. H. Hankin, of St. John's College, Cambridge, who was delegated to Berlin by the promoters of the proposed British Institute of Preventive Medicine, to study the mode of manufacturing Dr. Koch's lymph, has otherwise made good use of his time here. Had he contented himself with waiting for such revelations as Dr. Koch might have vouchsafed, it is probable that the two months he has spent in Berlin would have been lost. As it is, Mr. Hankin, who had obtained a place in Dr. Koch's laboratory, seeing the hopelessness of expecting information on the subject which he had come to study, devoted himself to the discovery of a cure for Anthrax, a subject which had already occupied his mind for some years. It

is known that rats enjoy a natural immunity from a great number of infectious diseases, including Anthrax. Mr. Hankin, while availing himself of the knowledge of this fact, has based his discovery on an entirely new principle. His first object was to find out the cause of this fortunate peculiarity of the rat, and his researches led him to discover that the bodies of these animals contain a substance which has the remarkable power of killing the Anthrax microbe. This substance belongs to a class of bodies called the protective proteids, which were discovered by Mr. Hankin some months ago, and described in a paper that attracted considerable attention at the time. These substances, which are found in the spleen and other parts of the body in various animals, have the power of killing bacteria, and may be regarded as a sort of natural antiseptic formed by the animal organism to protect itself against the attacks of microbes. In the case of most animals these protective substances are of so unstable a character that the microbe is able to destroy them, and so flourish in the body, and thus produce disease. With rats, however, this is not the case, and their protective proteid turns out to be of a more stable nature, and therefore can resist microbic invasions. The problem that Mr. Hankin set himself was how to isolate this substance in a state of purity, and he achieved this by extracting the spleens of rats with 50 per cent. glycerine. It is curious that Dr. Koch employs the same medium in the preparation of his lymph, and that Mr. Hankin devised his method independently of Dr. Koch, and before the latter's last paper was published. The glycerine extract in Mr. Hankin's process is precipitated with alcohol and redissolved in water. A minute dose of this solution injected under the skin of a mouse was found sufficient to cause its recovery from the most virulent Anthrax. The experiment has been repeated on a number of subjects with gratifying success. This discovery derives additional interest from the fact that Anthrax is not the only disease from which rats enjoy immunity, and consequently Mr. Hankin's discovery opens up a field of research, the exploration of which may be of the greatest value to the human race. For instance, it is well known that rats are not subject to Diphtheria, and hence it is possible that Mr. Hankin's protective proteid may also produce a cure for this terrible disease.

ON SOME OF THE PROBLEMS OF MODERN PHYSIOLOGY.*

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It is just ten years since I began to take an active interest in the affairs of this Society. At that time Allen Thomson, Andrew Fergus, Ebenezer Watson, William Wallace, Joseph J. Coleman, and Henry Muirhead were members of Council. These and many other members of the Society have passed away, and this place knows them no more. It is only a few weeks since we lost Dr. Henry Muirhead. An adequate notice of him will be read to us this evening, and I therefore forbear saying more than that by his removal our Society has lost a true friend, and Glasgow has lost a man of character who had high aims and noble purposes. But, although individuals disappear, the Society has a corporate life, and its work will go on while it carries out its important functions of aiding in the diffusion of knowledge, of encouraging research, and of serving as a centre in Glasgow for all who are interested in the advancement of science.

Last year you did me the honour of electing me to the office of President, and now, at the beginning of a new session, it is my duty to deliver an

* Read before the Glasgow Philosophical Society on November 5th, 1890.

address. Various topics presented themselves to my mind as worthy of your attention, such as a general review of scientific progress during the year, the impending changes in our University system, or the present position of technical education in Glasgow; but, on the whole, you will probably be better pleased if I address you on my own subject, and lay before you some reflections on the Problems of Modern Physiology. It is not my intention to weary you with such details as may be found in memoirs, and in the pages of text-books, but rather to approach the subject from the philosophical side, and to indicate the present position of physiological thought and speculation with regard to some of the more profound questions that occupy the attention of physiologists.

In tracing the history of any science one soon discovers that there are times when, in the wake of a great discovery, or of a wide generalisation, it is necessary to recast the whole subject, or to view it from a new standpoint. The introduction of the atomic theory into chemistry, the recognition of the law of conservation of energy in physics, and the adoption of a theory of evolution in biology, are examples of such epoch-making events. Again, a science occasionally makes a new start. She leaves the old and well-gleaned fields and explores new territories, adding to her stores at every footstep. Such happened in chemistry when the investigator first went into the domain of organic compounds; in physics when, as we have seen even in our own day, the field of electricity has been traversed by a thousand workers; and in biology when the naturalist turned his attention to the study of development or embryology. A similar change has happened in physiology; at all events, so many new facts have been collected in recent years, by the experimental mode of inquiry, as to make it necessary to review the whole ground, and to recast some of our older notions.

Physiology is intimately connected with anatomy, and most people would say that anatomy was the older science. This is true in one sense, but not in another, as it is evident that men in bygone ages must first have watched the movements of animals, the taking of food, and other physiological processes before they began to dissect. They took the body of the animal to pieces to see how it worked. Thus anatomy arose, and its study is justly regarded as preparatory to the understanding of all vital actions. In later times anatomists have devoted more attention to form and structure, apart from a consideration of the processes by which these have been evolved. This department of science is now called morphology. It has its own problems in determining the outward appearance, internal build, and structural relations of organised bodies.

Modern physiology deals with the actions of living beings on their environment, and with the action of the environment on living beings; and it considers structure only so far as it illustrates or explains action. The progress of the science has shown, however, that there are numerous problems on which a knowledge of structure throws no light. Thus the movements of the body are effected by muscles. We study anatomically the framework of bones, the joints, the arrangement of the tendons, and their attachment to the bones; and, by a study of these mechanical arrangements, we obtain an idea of how any particular movement is accomplished. But the fact that the movement is effected by a contraction of the muscular fibres by which their ends are approximated remains unexplained, and we are obliged to ask the question, Why do the muscles contract? We find that muscular matter will contract on direct irritation, and that the stimulus usually causing it to contract is a change passing to the muscle along the nerves. This leads us to investigate the actions of nerves, and we ascertain that the change coming along a nerve to a muscle, which causes it to contract, originates in a brain or spinal cord, or nerve centre, as it is termed; further, we find that the change in the

nerve centre may in turn be excited by influences coming to it from the periphery of the body along sensory nerves, and that these influences may, by acting on the nerve centre, originate muscular movements at once, or after a long delay. Then, again, we arrive at a knowledge of the fact that many of the changes in these nerve centres are connected with consciousness; and, finally, we must conceive a nerve centre as frequently in a state of molecular agitation or change—currents flowing in or passing out, connecting the sensory surfaces with the muscular and other apparatus, and welding the whole body into one harmoniously-working machine. These are all phenomena beyond the range of the anatomical mode of inquiry.

In the next place, we find that food and air are necessary to a living being. The body of a living being is composed of complicated and unstable chemical substances, capable of being oxidised, and of being reduced by oxidation to simpler and more stable compounds, with a setting free of energy. These more stable compounds are water, carbonic acid, nitrogenous compounds such as urea and salts. Substances similar in character are produced from organic matter, whether it be quickly oxidised by burning, or more slowly in the animal body, or still more slowly in the changes that occur when a body is allowed to decay in the earth. During life simple compounds are being constantly produced by oxidations. At every moment some part of the substance of the body is suffering decay by undergoing combustion, and complex substances full of latent energy are by processes of oxidation reduced to simpler substances containing only a little energy or none at all. Thus we arrive at the astonishing conclusion, that "every act of life is the outcome of an act of death."* The contraction of a muscle, a beat of the heart, every action of the nervous system, the formation of something in the cell of a gland—all these processes are connected with the splitting up of complex into simpler molecules, or, in other words, with the crumbling down in a molecular sense, of the tissue. In the case of muscular tissue, most of the energy thus liberated is set free, either as heat, or as motion in the form of muscular work. Thus energy is continually expended, and to make up for the loss we take food, which is a mixture of highly complex energy-stored bodies, and we breathe in oxygen whereby the oxidisable matters are reduced to simpler compounds, and the kinetic energy set free does work. But the food is not all oxidised simply in passing through the body; some of the compounds formed from it become, for a time, part of the living matter itself.

Thus we see that the ultimate problems of the physiology of the present day are concerned with the changes in living matter on which the phenomena of life depend. This is the characteristic of the science as it at present stands. The first physiologists attempted to explain the phenomena of the body by assuming the existence of animal and vital spirits. The animal spirits were more closely connected with the phenomena of animal life, whilst the vital spirits were common both to animals and plants. By-and-by it was found that many phenomena could be accounted for without such agencies, and a more mechanical explanation was adopted. The next step was the recognition of the uses of organs of the body, and the body was conceived to be built up of a series of machines, all more or less independent, but all co-operating in the general life. The work done by an organ was termed its function. The value of this line of thought was so great that it soon dominated physiology, and for a long time it reigned supreme. Further, we must not forget that this view of organs and functions produced brilliant results in physiology. Thus the doctrines of the circulation of the blood established by Harvey are the outcome of a study of the mechanism of the

* Michael Foster. Art. "Physiology" in *Ency. Britann.*

heart and blood vessels, considered as organs; and many other problems, such as the movements of respiration, the mechanism of the voice, etc., are capable of solution by the application of mechanical principles to anatomical facts. The anatomical mode of inquiry, however, as we have already seen, did not solve every question. When applied to the case of the liver it showed only the arrangement by which blood was carried to and from that organ, and the ducts for carrying away the bile. The function of the liver was therefore said to be to secrete bile, and for many years this was considered to be the only function of that important gland. Another example of the failure of the anatomical method alone is that for many years no function whatever could be assigned to certain organs, such as the spleen, a large and complicated structure, existing apparently without a purpose, but now known to be concerned in the elaboration of blood and, possibly in the disintegration of effete materials.

The next great conception, which was the completement of the doctrine of organs and functions, was the cell theory. This defined the cell as the physiological unit, and all functions of an organ were said to be the aggregate of the functions of the individual cells forming that organ. It was hoped that by a study of the forms, sizes, and general properties of cells, a complete knowledge of functions would be obtained.

The application of the cell theory as an explanation of physiological phenomena received a shock by the discovery, about the middle of this century, by Claude Bernard, of the glycogenic function of the liver. He showed that the secretion of bile was not the only function of that organ, which, in addition, formed a large quantity of starchy matter, to which the name of glycogen was given. This discovery could not have been made by the most diligent scrutiny of the cells of the liver with the highest microscopic powers, and a mere knowledge of the arrangements of the gland as regards blood vessels, ducts, and cells, would have left this function unknown. On the other hand, the discovery might have been made by one having no knowledge of the anatomical structure of the liver. Bernard also demonstrated that this animal starch played an important part in the nutrition of tissue, more especially of the muscles.

As science advanced, the definition of a cell laid down by the founders of the cell theory had to be modified. The original definition of a cell was a small body having a cell wall, cell contents, and a nucleus or kernel, and it was assumed that here we had the fundamental structure with which the phenomena of life were associated. But discovery showed that these phenomena might be manifested by a mass of matter destitute both of cell wall and of nucleus, and consisting only of jelly-like matter, containing a few granules. Then arose the theory of protoplasm. The matter called protoplasm was now regarded as the material basis of life, and the great step was taken of abandoning all conceptions of life as the outcome of organisation, or the mechanical result of structural conditions. This view of physiological processes regards all vital phenomena as products of certain essential endowments or fundamental properties manifested in living matter. Organs merely modify the activities of living matter, and the function of an organ is the expression of the activities of the living matter composing it. The arena of life was shifted from the cell to protoplasm.*

Research, however, soon showed that there are various kinds of protoplasm, and that even protoplasm, when examined by special methods, affords indications of structure. It is not a homogeneous jelly, nor a granular jelly, as has been described, but it often contains a fibrillar network, in the meshes of

* See author's paper on "The Modern Cell Theory and the Phenomena of Fecundation." *Proc.* Phil. Soc. of Glasgow, vol. xix., p. 71.

which there is some kind of matter. It is not, however, strictly correct to speak of this fibrillated arrangement as a permanent structure, because it is not constant. It varies much from time to time even in the same mass of protoplasm. This protoplasmic matter, as found in an amœba or in white blood corpuscles, manifests the phenomena of life: it moves; it assimilates dead food, and raises it to the level of living matter; it is the seat of chemical changes of a very active character, and, in particular, it has very great reducing powers. It has been shown that the protoplasm of vegetable cells reduces salts of silver, and, founding on this chemical phenomenon, Loew and Bokorny have advanced the theory that living protoplasm contains a chemical compound of the nature of an aldehyde.* Its characteristic condition is one of incessant change; molecular processes are constantly going on in it, leading to the up-building or the down-falling of its substance. Whether protoplasm be a single highly complex chemical compound, or a number of such compounds, we do not know; but even if we suppose it to be one compound, it probably does not exist for more than a very brief space of time in the same condition. At one instant it is made, and in the next it is unmade. It is built up of matter that was once dead but now is alive. Dead food rises by a series of steps to the condition of living matter; this living matter is protoplasm; then the descent on the other side begins, and ends in the matter being split up into the simple substances which are what we may term the waste products. The dead food, itself only partially stable in character, becomes still less stable as it rises into the complex living material, and the instability arises from chemical affinities being unsatisfied. When it reaches the level of living matter it is so unstable that the chemical compound represented cannot exist, and on the slightest stimulus it explodes, in a molecular sense, and then begins its downward career. The downward course is a series of explosions, by means of which the energy latent in the living protoplasm becomes kinetic. Some of this liberated energy is used up within the material itself, so as to repeat the process of converting dead food-stuff into living matter; and the rest of the energy leaves the body chiefly as heat or motion. These processes are now expressed by the terms (first employed by Dr. W. Gaskell), anabolism and katabolism, the former denoting the up-building and the latter the down-pulling process; or, in other words, anabolism is winding up, and katabolism is running down. Both of these processes work in response to external stimuli. Thus certain nervous stimuli are anabolic, while others are katabolic—the first causing the living matter to rest and the second rousing it to action.

The intrinsic properties of protoplasm then are (1) *assimilation*, or the power of converting dead food into its living self; (2) *movement*, or change of form—*contractility*, as it is usually called, arising from internal disruptive changes; and (3) *irritability*, or the property of responding to stimulation by changes so minute as to escape the observation of the unaided senses. To state the facts in another way, the functions of protoplasm are the absorption of oxygen; the discharge of water, nitrogen compounds, such as urea, and carbonic acid; the production of heat, light, and electricity; and the performance of mechanical work. Chemical processes are related to all these forms of activity, or, in other words, we may say these properties of protoplasm are fundamentally chemical. But these characteristics are manifested in different degrees by different specimens of protoplasm, and even by the same protoplasm at different periods of its existence, for the changes occurring in one kind of protoplasm may be such that the decompositions result in

* Oscar Loew and Bokorny: "Die Chemische Kraftquelle in Lebenden Protoplasma." Munich, 1882. See also author's "Text-Book of Physiology," vol. i., p. 60. Glasgow, 1888.

energy being set free only in the form of heat, no visible change of form ensuing. This is the case with the protoplasm of the nervous tissues and secreting cells. Again, in another specimen of protoplasm, such as exists in the muscular and other contractile tissues, the energy may be set free both as motion and as heat, and the most striking result of the molecular change is movement. It is the business of the physiology of the future to determine what it is that causes one kind of protoplasm to differ from another. If it depends on internal structure, that must be of a molecular character, which no scrutiny with the highest microscopical power can ever detect, as the optical method of inquiry has probably come near its limits. It is true that, as the protoplasm manifests more and more one or other of its fundamental properties, structural characters may gradually make their appearance; but even these seem to be of subsidiary importance, and not to be the real cause of the specific kind of action. For instance, contractile tissue may, by long-repeated activity and specialisation of function, take on the structural characters of striated muscular fibre, but these characters are not essential to the contraction of the fibre. Many fibres contract that are destitute of the structural characteristics of striated muscle. Nor is even the form of a fibre necessary to contraction. The fibre contracts because it contains protoplasm having the intrinsic property of altering its form, owing to molecular changes excited by a stimulus. In this way we gain the position now reached by the most profound thinkers in physiology, that while protoplasm exists in differentiated varieties, each variety still retains more or less of the general properties of protoplasm. In other words, while there is variety in the results of protoplasmic activity, there are underlying in all kinds of protoplasm certain fundamental properties of a primitive substance.

I might illustrate this by tracing the differentiation of the protoplasm of the cells forming the primitive layers of the embryo, showing how the various tissues are built up, and from these the mechanisms which we call organs, and pointing out especially that the functions of all these organs depend on the activities of the protoplasm contained in them. Hitherto the attention of physiologists has been largely occupied, and very properly occupied, with investigation into the general mechanism of these organs. For example, we are now acquainted with the arrangement of the circulation of the blood, viewing the heart as a contractile force-pump driving the blood through a series of elastic and contractile tubes, the blood stream being guided by valvular structures. There in probably not much to be done in this direction; but there still remains the problem of the molecular changes happening in the wall of the heart itself. What is the cause of the heart's rhythm? What relation has the rhythm to the activity of the nerve cells in the wall of the heart itself? Again, we know that the blood is driven through the tissues and organs, and that each element of living tissue selects from it the matters which it needs for its growth and activity, but there are hidden molecular processes in the structures separating the blood from the tissues and concerned in the absorption by the tissues of the nutrient materials. We have been too much in the habit of regarding some of these phenomena as simply physical processes like endosmose and exosmose, forgetting that the structures through which the nutrient materials pass are composed of living protoplasm, which so modifies the physical process as to make it unlike what would happen if the membrane were dead.

Are we getting any insight into molecular processes concerned in life? This question may be answered by studying the changes in the cells of a secreting gland. Take, for example, the pancreas. Its microscopic structure shows a number of cells grouped around a space at the end of a canal, which is the beginning of one of the ducts of the gland. Each cell is a minute spheroidal body, composed of protoplasm, having a nucleus, and showing a

network of fine fibres. We may disregard the nucleus, as it has nothing to do with the secretive activity of the cell, and is concerned only in its reproductive processes. One side of the cells is bathed in a fluid called lymph, which has transuded from the capillaries in the neighbourhood; the other side is free and projects into the space. Secretion consists in the accumulation of fluid in this space, and as it is formed it is carried away by the ducts of the gland. Now, few of the elements of the secretion, if any, exist performed in the blood; they must, then, be produced by the activity of the cells of the gland. The cells are nourished by the lymph, and they grow and undergo various changes that have been observed only during the last few years. It has been noticed that in the cells there are periods of rest alternating with periods of activity. During the period of rest the cell grows and increases in size, and this is owing, not so much to increase in the network of the protoplasm, as to an accumulation of material in the meshes of the network. It has further been noticed that as the material in the meshes increases the network diminishes, pointing to a conversion of the substance of the network into the matter in the meshes. Sometimes this matter may be seen as little granules, and the granules collect chiefly at the side of the cell next the lumen of the canal. During active secretion these granules disappear, and the cell diminishes in bulk, and the living protoplasm gets rid of its stored-up material. The cell may still be growing, but the growth of protoplasm is chiefly during the period of rest. But a further discovery has been made. It has been ascertained that the ferment-matter in the pancreatic juice—a substance called tripsin—does not exist in the cells of the gland. The particles in the cells I spoke of are not particles of tripsin, but are particles of a material that readily yields tripsin. This material has been called tripsinogen, or generator of tripsin. The order of events would seem to be (1) the growth of protoplasm from materials supplied by lymph; (2) the conversion of portions of this protoplasm into tripsinogen; (3) the ejection of the tripsinogen; and (4) its conversion, probably in the act of ejection, into tripsin. We thus get a glimpse into the processes going on in this wonderful little laboratory. Possibly we see only several of the steps of the process. From the matter in the lymph to the protoplasm of the cell there may be many transient stages, and again from the fully-formed protoplasm to the particles of tripsinogen there may be another series of steps. It has also been suggested that the protoplasm by one magical stroke converts the material of the lymph into living matter, and then, in an instant, there may be the degradation of a portion of the protoplasm into tripsinogen. The evidence points rather in the direction that I have indicated.

Another illustration of molecular action is found in the study of the changes in muscle when it contracts. Here we have, not secretion, but a change of form—contraction. The evidence is gradually accumulating in favour of the view that this contraction is due to a sudden change (of the nature of a decomposition) of a contractile matter in the protoplasm of the muscle cell. When a muscle contracts there is the evolution of carbonic acid, the muscle becomes acid, from the formation of a variety of lactic acid, and there is evidence of other chemical changes. Do these substances directly come from the protoplasm of the muscle cell? There are facts pointing to a striking analogy with the changes in the secreting cell—namely, that the protoplasm of the muscle cell forms a contractile matter, and that this contractile matter is torn to pieces when a muscle contracts. The products of the decomposition are ejected; the protoplasm reconstructs the contractile substance at the expense of its own material; and the muscle cell is again ready for another contraction. The energy is set free both as motion and as heat, while in the case of the secreting cell it appears as heat only.

There is every reason to believe that molecular changes of a similar kind

occur in the nervous system. We know next to nothing of the chemical changes happening in nervous tissue, but a study of the nature of the nervous discharges that stimulate muscular fibre to contract, and a review of what is known of the order of events in various kinds of reflex actions, all favour the view that these phenomena depend on molecular disturbances of a chemico-physical kind. When a nerve is irritated, a change or molecular disturbance is propagated along it to the muscle; this change acts on the matter forming the nerve endings; and the changes in these, in turn, set up molecular ruptures in the contractile stuff of the muscle cell. Again, when a sensory impulse reaches a nerve centre, it may stop there—that is to say, its energy does not seem to be sufficient to do more than set up changes in the substance of the cell; but in other cases, or at other times, the change in the nerve cell may be propagated to other groups of nerve cells, and, these, in turn, may originate impulses causing muscular contractions. The fact that time is spent in these processes, the phenomena of fatigue, the formation of waste products, and the necessity of repair, all point to the occurrence of molecular changes.

One of the most remarkable characteristics of living matter, when it is adapted to the manifestation of energy in a particular form, is the economy with which the manifestation is accomplished. Thus in the case of muscle, energy is liberated as heat and motion, and the manifestation of these modes of energy is the result or expression of the chemical processes occurring in the muscle. A muscle may be regarded as an instrument or machine primarily for the production of motion, and the heat liberated is, in a sense, of secondary importance. Considered as a machine, it is a striking fact that as much as one-fourth of the energy of a muscle may appear as work, the remaining three-fourths as heat. The small amount of matter undergoing change is also remarkable. A frog's muscle, weighing less than a gramme, may be caused to lift twenty times its own weight through a height of five millimetres, at intervals of two seconds, for at least an hour without showing much fatigue, and the finest balance would scarcely show any loss of material. Taking man's body as a whole, observation has shown that about 25 per cent. of the total energy appears as mechanical work, about twice that of the best constructed steam or gas engine, which yields from 12 to 15 per cent. as work, the remaining 88 or 85 per cent. of heat being lost.*

Another instance is the economical production of electricity by electric fishes. The Torpedo (*Torpedo galvani*) has about 1,000,000 plates in its two electric organs; the electro-motive force of a single plate is ·0000117 of a volt; and the total E.M.F. of the organs at rest, if all the plates were simultaneously called into action (which probably never occurs), would thus be 11·7 volts.† At the moment of discharge it is much increased, as indicated by the strength of the shock, but I have been unable to find exact measurements. The electric organ of the more powerful electric eel (*Gymnotus electricus*) contains something like 8,000 plates, each of which has an E.M.F. of ·00006 of a volt.‡ The total E.M.F. of the organ at rest is therefore about ·48 volt, but at the moment of discharge it may rise as high as from 300 volts to 600 volts. The animal will give shocks of this strength at short intervals during several hours without showing fatigue; and this enormous expenditure of energy is obtained with a very small amount of tissue change. Only a very small portion of the energy is set free from the electric organ as heat—a por-

* See "Text-Book of Physiology," *op. cit*, vol. ii., p. 445.

† E. du Bois-Reymond: "Living Torpedoes in Berlin." In "Biological Memoirs." Edited by J. Burdon-Sanderson, p. 442. Oxford, 1887.

‡ Du Bois-Reymond, *op. cit.*, p. 442. Also Carl Sachs' "Untersuchungen am Zitteraal," p. 278, and p. 300.

tion so small as to have hitherto escaped detection. In August last, in experimenting at Stonehaven with the electric organ of the common skate (*Raia batis*) with the use of delicate thermopiles and a sensitive galvanometer, I was able to detect an evolution of heat in the electric organ on stimulating the nerve supplying it.

It will probably be found that in the organs of the electric fishes we have a production of electricity on an economical basis far surpassing anything yet contrived by man.

Still another example of the economy of nature in physiological processes is furnished by a remarkable series of observations recently made at the Alleghany Observatory, by Langley and Very, on the production of light by the Cuban fire-fly (*Pyrophorus noctilucus*, Linn.).* By the use of a bolometer, these observers were able to make photometric measurements of great delicacy and accuracy, and they have shown, to quote their own words, "that the insect spectrum is lacking in the rays of red luminosity and presumably in the infra-red rays, usually of relatively great heat; or, that it seems probable that we have here *light without heat*, other than that heat which the luminosity itself comprises, and which is but another name for the same energy" (p. 273). Experimenting with an amount of heat which would, in the time of one operation, only raise the temperature of an ordinary mercurial thermometer by less than one four-hundred-thousandth of a degree centigrade, they found that there was practically no heat in the spectrum; or, to put it in another form, "it follows that the insect light is accompanied by approximately one four-hundredth part of the heat which is ordinarily associated with the radiation of flames of the luminous quality of those which were the subject of experiment. . . . We repeat that nature produces this cheapest light at about one four-hundredth part of the cost of the energy which is expended in the candle flame, and at but an insignificant fraction of the cost of the electric light or the most economic light that has yet been devised; and that, finally, there seems to be no reason why we are forbidden to hope that we may yet discover a method (since such a one certainly exists and is in use on a small scale) of obtaining an enormously greater result than we now do from our present ordinary means for producing light."†

Living matter, then, exists in different conditions. The protoplasm of a muscle cell is not the same as that of a secreting cell, and both differ from the protoplasm of a nerve cell. Again, the protoplasm of a contractile cell from a sheep probably differs from that of a man, and there may be varieties even in individuals of the same species. And yet in all the kinds of protoplasm we have, in a subsidiary way, some of the fundamental properties. Thus all kinds of protoplasm assimilate and are irritable. By living protoplasm, then, we mean that state of matter which does not ascend higher in the scale of molecular complexity, but breaks down on stimulation into simpler compounds. It is a matter in a state of incessant change. When it dies it ceases to be protoplasm. According to this view, protoplasm exists only a brief space of time. The materials which we get from dead muscle—albumen, sugar, fat, saline matters, water—were never alive as such; there is no such thing as living albumen; these are matters formed on the death of the protoplasm, or, as we have seen, they have been derived from complex bodies that have once been protoplasm possibly existing in the meshes of the network at the time of the death of the protoplasm.

It is interesting here to notice, even at the risk of a little repetition, some

* See *London, Edinburgh, and Dublin Philosophical Magazine* for September, 1890, p. 260.

† The luminous surface of the fire-fly gave ·0024 calories per square centimetre per minute, or only as much heat was radiated by the insect as would raise a mercurial barometer between two and three millionths of a degree centigrade.

of the attempts that have been recently made by philosophical biologists to gain an insight into the constitution of living matter.* At one time it was supposed that the oxygen absorbed in respiration in a sense purified the blood by oxidising effete matters in it. It was shown, however, by Pflüger, in 1872, that the oxygen is not merely for the removal of effete matter, but that it serves as food for the protoplasm. This view directed attention to the protoplasm as the arena in which oxidations took place, and inquiries were made as to its constitution. It was soon recognised, in the first instance by the botanical physiologists, that protoplasm consists of two portions, one forming a kind of framework, and the other a more fluid part, existing in the meshes of the framework. The framework, according to this view, is stable and is living, and the more fluid part is not alive, but it is in a condition of active chemical change. The living part forming the framework acts on the non-living part after the manner of a ferment, exciting changes in it without itself taking part in the chemical operations thus induced. It has thus, to use the term of Berzelius, a catalytic action, and living matter, as we see it, may be regarded as consisting of a catalytic substance, the framework, and of a catalyte, the semi-fluid material. All oxidations occur in the catalyte within the meshes of the living framework. You will observe that this modifies the popular conception that the structure of the body is not permanent, but is undergoing renewal and decay. The more modern view suggests that there are parts of the framework of our tissues that may remain intact for long periods of time, and that it is only a portion of the tissues that undergoes tear and wear and renewal.

Further, Nägeli has suggested that living matter is composed of particles called micellæ, far too minute to be seen with the highest microscopic powers, and, in fact, identical with the molecules of the physicist. This conception has been modified by Pfeffer, who recognised that a micella, the ultimate element of living matter, according to this view, is not a molecule but a group of molecules, probably of different kinds. To this he gave the name of tagma (*τό τάγμα*—that which has been ordered or arranged; a division, a brigade) as indicating a system or group. By the union of tagmata the framework is formed, and in its meshes, according to Sachs, water may be condensed to less than its normal volume, as in the vital turgescence of plants. Life does not therefore occur in slime, but in a framework, some conception of which may be formed by the idea of a sponge.

Animal physiologists have not advanced so far in this direction. The only attempt has been made by Engelmann, who has applied the terminology of Nägeli and Pfeffer to the structure of muscle. The structure of striated muscular fibre resembles that of a crystal, inasmuch as each portion resembles every other portion. If we cut a muscle transversely, a number of cylindrical parts are exposed, and each of these may be regarded as made up of a large number of still more minute portions, termed ino-tagmata by Engelmann. Each minute ino-tagma is a short cylinder, which during life has its axis parallel with that of its neighbours, and during activity there is a flux or flow of the catalytic matter from each pole to the equator. When a muscle fibre contracts, according to this view, the change does not occur in the tagmata but in the matter between them, and it consists in a flow of matter from poles to equator, the flow occurring along with sudden oxidations, change of electrical state, and disengagement of heat. Bernstein† has applied this

* See Address to the Biological Section of the British Association, by Professor Burdon-Sanderson, F R.S. *B.A. Report*, 1889.

† For details, see Burdon-Sanderson's Address, *op. cit.*, p. 8. Also Bernstein: "Neue Theorie der Erregungsvorgäace und Electrischen Erscheinungen an der Nerven-und Muskel-Fasern." Untersuchungen aus dem Physiologischen Institut. Halle, 1888.

theory to the explanation also of the electrical phenomena of muscle. The result is that we may regard the chemical operations, electrical phenomena, evolution of heat, and change of form as manifestations of the same process.

What conception can we form of the nature of life, after a consideration of these statements? Some thinkers have attempted to draw a distinction between vitality, as the special property of certain collocations of matter, and that peculiarity of living beings by which they possess unity and individuality. Vitality, they say, is inherent in each cell, but, an organism exists as a whole by the reciprocal action of its elementary parts. The question is asked—Has this interdependence of parts its efficient cause in the properties inherent in living matter itself, or does there reside in the body a power which adjusts those parts into conformity with an idea, arranging and combining them for a definite purpose? My own opinion is that we cannot draw this distinction between the life of the body as a whole and the life of its individual parts. The somatic life is the expression of the lives of the millions of living particles of which the body is composed. Whether, however, we contemplate the general life or the life of any particular cell, is our explanation to be teleological or physical? Is there any intelligent agency at work or are the phenomena of life merely the outcome of the laws of molecular physics? A teleological explanation is the only one in my judgment that meets the case. Adaptation is characteristic not only of every organism as a whole and as regards its environment, but also of the parts of the organism as regards their mutual relations. Adaptation in the body or in the individual cell cannot be explained by the operation of physical laws alone, working according to the rules of blind necessity, and a careful study of the phenomena of life suggests something outside the mechanism with which we find it associated. But what is the nature of this external agent that works upon and co-operates with matter to produce the phenomena of life? It is not satisfactory merely to give it a name and call it vitality or the vital principle. This explains nothing. As we cannot think of an agent or force acting independently of matter, may not some of the properties of living matter depend on matter in peculiar conditions with which we are as yet unacquainted?

Few, if any, physiologists would now-a-days assert the existence of a vital principle. A special vital force is not assumed as an agent in explaining physiological problems in simple structures. The term may be used for convenience, serving, in the language of Kant, as a resting-place where "reason can repose on the pillow of obscure qualities;" but it explains nothing. Nor is it enough to say that vitality is a property of protoplasm. Is it not nearer the truth to regard it as a special condition of matter? Physicists consider the properties of things as the result of movements either of what may be termed the grosser particles of matter, or of an ether which has a substantial existence; and there are theories in physics by which the constitution of even matter itself is referred to properties of the ether. May we not also get a conception of the vital state when we consider it as a mode of motion? The properties of living protoplasm may be regarded as the result of intricate molecular movements. It is not necessary, however, to restrict these movements to the molecules of matter that explain to the physicist certain physical phenomena, such as cohesion, elasticity, chemical affinity, but to those more subtle and evanescent movements which he assumes to occur in an ether, and by which he attempts to explain the properties of light and electricity. No doubt physicists are acquainted with facts which practically prove the existence of this ether; and, by assuming that it has certain properties, they can explain the phenomena of light, and many of those of electricity. I readily admit that no such attempt has yet been made in the sphere of physiology,

but it is not to be lost sight of. At the same time, it is evident that, even if we were able to account for certain vital properties by a reference to movements in the ether, we would still be confronted by the same problem. At one time men thought they had got to the secret of life when they reached the cell: now they desire to come to closer quarters; but even supposing they worked out the molecular movements in, say, a nerve cell in the cerebrum, they would be no nearer an explanation of consciousness, with which the vital activities of a nerve cell are undoubtedly associated. All that I plead for is that, when we attempt to refer the phenomena of life to movements of matter, considering matter in the widest sense of the word known to physicists, physiologists are not to be charged with gross materialism, more especially when they assert that even these ethereal movements will not account for all vital phenomena, more especially those of consciousness.

Many dislike such speculations because they have a gross conception of matter and of its properties. This dislike would vanish if they took a more profound view of the constitution of matter, and if they gave weight to one of the lessons of physiology—namely, that our knowledge is limited by the nature of our organs of sense. We have no right to assume that we are acquainted with all the properties of matter; and it is not unreasonable to suppose that the phonomena of vitality are in their essence due to movements which cannot be detected by the most delicate and refined instruments, but which may same day be reasoned about on a basis as sound as the undulatory theory of light. Arrest the movements by the removal of water, as in dried seeds and dried infusoria, and the phenomena of vitality cease until they are again moistened. Stop the movements by cold, and the organism becomes dormant; but the molecular machinery starts again when it is raised to a certain temperature. Heat the living matter beyond a given temperature, and the molecular movements are so altered, disturbed, retarded, or quickened, as to be incompatible with the living state, and the machinery flies to pieces. The properties of different kinds of living matter depend, according to this view, not merely on the properties of the chemical elements or chemical compounds which we can extract from it after it is dead, nor on the play of ordinary physical forces, nor on the action and reaction between the living matter and its environment, but on the particular kinds of molecular motion occurring in the living stuff. Thus vitality may be regarded as a dynamical state. It is a condition of matter *sui generis*. It may be as vain to speculate on the origin of vitality as it is to inquire how certain movements of the primitive atoms first started certain physical phenomena. We may be content with the belief that the Creator of the Universe called matter into existence, endowed it with properties, and started its atoms into those mazy dances of molecular motion on which the phenomena of vitality depend.

It is significant to note the change that has taken place during the last few years in the physiological mind regarding the true nature of physiological processes. Fifty years ago, Mayer of Heilbronn, in a celebrated treatise, showed the relation between organic motion and the exchange of material in living organisms, and he demonstrated that certain functions, regarded as vital, could be measured, and the results referred to standards of quantity. He pointed out quantitative relations between different kinds of energy, and did much to lay the foundation of the present theories held by physicists regarding energy. This work exercised an immense influence on physiological discovery. It guided Von Helmholtz in his researches into the physiology of nerve and muscle, Du Bois-Reymond in his investigations into the electrical phenomena of living beings, and Ludwig in his demonstration of the hydrodynamics of the circulation. The general effect of such researches was to curtail apparently the sphere of vital

processes and to lead to the acceptance of physical explanations of physiological phenomena.*

For many years the majority of the processes occurring in the body were supposed to be explicable by chemical and physical laws, and too little attention was paid to the circumstance that these processes did not occur in dead but in living matter. A strong reaction against an exclusive mechanical view has undoubtedly set in. It is now recognised that while the mere movements of the blood in the heart and vessels are subject to the laws of hydrodynamics and hydrostatics, the activity of the heart itself, the contractility of the smaller arteries, and even the special kind of elasticity seen in the coats of the larger arteries, cannot be explained by physical laws. Again, while absorption from the stomach and intestinal canal of the foodstuffs prepared in the processes of digestion is in accordance so far with the physical laws of exosmose and endosmose, we must not forget that the absorptive membrane is covered with millions of living cells, each of which apparently exercises a selective power over the substances presented to it, appropriating certain constituents and rejecting others. Another example is the secretion of urine—in some respects a physical process of filtration of certain matters from the blood, but a process modified by living cells that line the capsules of Bowman and the uriniferous tubules. Much was expected from the discoveries of the electrical phenomena of muscle and nerve, but it must be confessed that these phenomena have not thrown much light on the real nature of muscular or nervous action. The purely physical phenomena have been worked out with surprising success. Thus we are acquainted with the mechanism of the eye considered as an optical apparatus, and we find the eye behaves according to the laws of refraction, but we know little yet as to the specific action of light on the living structures of the retina. We can apply the laws of acoustics to the arrangements in the external and middle ear for the conduction of sound, but the mechanism of the inner ear by which these vibrations are communicated to the living cells, and by these transformed into nervous impulses passing to the brain along the filaments of the auditory nerve, is still shrouded in mystery. Our explanations always fail when they are applied to the phenomena of living matter. Hence, a new school of vitalists is forming among physiologists, and a conviction is gaining ground that our present methods for the investigation of the mystery of vitality, even when manifested by the simplest cell, have for the present reached their limit. The further we push our researches the more complex the problems become. The notion that the first phenomena of life are manifested by a jelly-like structureless matter, as we have seen, must be abandoned. Careful investigation with the highest microscopic powers, and with the best staining reagents, shows details of structure hitherto unnoticed; but a discovery of this complexity of structure only reveals a new set of problems, and does not help us in knowing how the living thing manifests its wonderful properties.

Nor can a study of the chemical processes occurring in living things help us much in approaching the secret of vitality. To take an example, I may adduce what is now known as to the formation and absorption of peptones in the stomach. Not long since the explanation of the formation and absorption of peptones appeared to be that they were dialysable bodies formed from proteids by the action of the gastric juice, so that such proteid matter might readily enter the blood. They are formed by a process of hydration, a molecule of water becoming united to a molecule of albumen. This view is confirmed by the fact that if we act upon peptone with a substance having the power of removing a molecule of water from it, such as anhydrous acetic acid, the peptone may be re-converted into albumen. But

* See Burdon-Sanderson's Address. *Op. cit.*

a more careful study shows that the process is not so simple as was at one time supposed. In the first place, there are only the faintest traces of peptones in the blood, and, in the second, their presence in the blood in any appreciable quantity is followed by poisonous symptoms. Large quantities of peptone are poisonous. It would thus appear that the living cells covering the mucous surface of the stomach have the power of taking up these peptones, and that after changing them into serum albumen by a dehydration, they pass on the serum albumen to the blood stream. Here we have an instance again of the peculiar activity of living cells. Peptones readily dialyse through a dead animal membrane, such as the thin wall of a stomach, but when the wall of the stomach is alive they are converted into serum albumen. Why, then, should peptones be formed in the first instance? The only answer that can be suggested is that proteid matter in the form of peptone is the appropriate food for these living cells, that these cells pick peptones out of the digested matters bathing their surface, and then pass them on into the blood, transforming them in the act of passage into serum albumen. Many other instances might be given all tending to show that there are peculiar chemical activities in living matter, and that we are very far yet from accurate knowledge on this subject.

Still there is no ground for despondency. Physiologists must push their researches by physical and chemical methods into the arcana of living matter, in the hope of getting information as to the molecular machinery on which vitality depends. It is a first condition of success that we clearly define the limits beyond which chemical and physical explanations cannot at present pass. We know then where we are, and from that point we can go on and ask more searching questions. Science recognises no impassable boundaries; and although the difficulties in the way of a final answer to many physiological problems are enormous, we may expect that as years, perhaps centuries, roll on, these difficulties will gradually disappear, and the darkness will be dispelled by the steady light of more profound knowledge.

RABIES IN THE MALAY ARCHIPELAGO.

According to Penning, veterinary surgeon in the Dutch East Indies, Rabies appears most frequently among dogs in the islands of Java and Sumatra in the paralytic form. Therefore it happens that the number of persons bitten by rabid dogs is considerably smaller, and in each case less severely, than in Europe. Besides, the dogs in the Indian villages are generally afraid of man. The course of Rabies is acute and of short duration; paralysis appears within the first twenty-four hours, commencing with the posterior extremities, and quickly affecting the whole body. This accounts for the rarity of wandering rabid dogs.

EXTRAORDINARY PROLONGED INCUBATION OF HYDROPHOBIA.

A case of Hydrophobia is reported by Mr. Spencer, Assistant Surgeon to the Westminster Hospital, in the *British Medical Journal* for February 7th, which scarcely leaves any doubt that this fatal disease may have a very prolonged incubative stage in mankind; and if this be so for the human species, may it not also occur in animals? Mr. Spencer reports as follows:—

G. C., aged 5½ years, was bitten by a dog in Pimlico on August 25th, 1888. The dog, an adult Skye terrier, had been taken by its owner for a walk. The dog rushed wildly about, and became very hot. The owner observed that something must be the matter with the dog, and gave it water to drink.

On the way home the dog attacked the child, to whom it was strange. The child either fell or was knocked down, and whilst on the ground the dog bit the child in the right popliteal space, which was bare.

A man who saw the accident, and had had some acquaintance with poisoned wounds in India, sucked the bite, and took the child home. It was taken immediately by its mother to Dr. Crane. He found two wounds, both caused by the same bite, on the right leg; one a deep punctured wound, such as might be caused by the canine tooth, over the insertion of the biceps tendon, and the other more superficial and nearer the middle line behind. He injected liq. hydrargyri perchloridi, *B.P.*, into the deepest parts, washed the surface with the same fluid, and then cauterised the wounds.

A boy applied to Dr. Crane on the same day who was said to have been bitten by the dog. There was a bruise on his leg, but the skin was not in the least broken. The owner, a man aged 80, came to Dr. Crane on August 27th, 1888. The dog had bitten his hand, and had entirely removed the skin from a surface as large as a sixpence, besides making some scratches and indentations. The bite had been inflicted half an hour before. The animal had been "strange in its manner," and, when he had tried to get it from under the bed, it bit his hand. The dog died in the night of August 27th-28th, 1888. Dr. Crane formed the opinion that the dog had died rabid. He took full notes at the time, and tried to get the carcass or a piece of the spinal cord sent to the Brown Institution, but his efforts were frustrated. The mother summoned the owner, who was fined £1 by the magistrate, and the man who had sucked the wound received a small pecuniary acknowledgment. The child's wounds healed in a few days. Dr. Crane treated the owner for several weeks with perchloride of mercury, but the mother refused similar treatment for the child.

The child continued well, except that Dr. Starkie treated it for some trivial ailment in August, 1890, and at times it had screaming fits when excited. Dr. Starkie was called to the child at 6 p.m. on December 24th, 1890. She was sitting up in bed, apparently quite cool and collected, complaining of slight difficulty in swallowing and pain in the right leg. There had been a drunken quarrel in the house on December 22nd, which had excited the child, since which time she had not been well. Dr. Starkie, thinking that this might be the cause of the complaint, prescribed potassium bromide. He was called to the child again at 11 p.m. because swallowing was more difficult. He asked the mother whether the child had ever been bitten by a dog, and then she recalled the incident of August, 1888, which she had until then forgotten. Dr. Starkie gave the child a teaspoonful of the bromide mixture to swallow. At first she said she could not, but after persuasion, taking the teaspoon in both hands, she threw the fluid into her mouth. Immediately she was seized with a paroxysm of dyspnœa, convulsions of all muscles, and retching. Frothy mucus came from the mouth. The pain was referred to the right leg along the outer side from the great trochanter to the ankle. One scar over the insertion of the biceps tendon was one-eighth of an inch in diameter and circular in shape; the other scar, less well marked, was nearer the centre of the popliteal space.

Between 12 and 1 a.m. on December 25th, the child became so violently delirious that it required two men to keep her in bed. At 7 a.m. she became quieter and died at 8 a.m.

A *post-mortem* examination was made by Dr. Starkie at 4 p.m. on December 27th. He found the sinuses and superficial veins of the brain engorged, and the cortex slightly congested, but there was no sign of Meningitis, tuberculous or cerebro-spinal. The spinal cord looked quite normal, and there was no increase of cerebro-spinal fluid. The heart contained an *ante-mortem* clot, the lungs were congested, but showed no signs of Pneumonia.

The stomach and larynx were not examined. The cicatrices were carefully noted, as before described, and there were no other scars on the body.

The medulla and a piece of the spinal cord were placed in glycerine and brought to the Brown Institution. I inoculated a rabbit on December 31st, and it continued well until January 18th, 1891. On that day it showed slight signs of Paraplegia. On January 19th the Paraplegia was complete, and it died on the 20th. The stomach was congested, and dotted with many small hæmorrhages; the larynx and pharynx were also congested. These parts have been preserved. Two other rabbits, inoculated at the same time, have since died, also with typical hæmorrhages in the stomach.

REMARKS.—The description of the case in detail is necessary because it exceeds the utmost limit—namely, two years—hitherto proved to have intervened between the bite and the onset of Hydrophobia. The death of the child from Hydrophobia has been proved. That the dog died of Rabies is, I think, evident from its altered manner in rushing wildly about, and later on crouching in the dark, from the fact that it bit its owner, to whom it had been previously attached, and soon afterwards died. There was no evidence, neither before nor after death, to show that the child could have been inoculated with Rabies in the meantime, and the occurrence in the limb bitten of pain as an early symptom confirms the conclusion that the Hydrophobia was caused by the bite of a rabid dog two years and four months before. If, therefore, the Rabies poison can lie dormant so long in a human being, why not also for a long time in the dog?

The protest against the withdrawal of the muzzling orders is supported by the whole weight of scientific opinion, but from the other side emotional arguments are brought to bear upon the Government and local authorities. The result of withdrawal will be a fresh collection of material for a future epidemic.

It would be foolish to suppose that Rabies has disappeared. I have, during 1890, made inoculations for Professor Horsley, and six dogs were shown to have been rabid at the time of death; they came—one from Petersfield, Hants, two from Beverley, one from Melton Mowbray, one from Nottingham, and one from Dover, all since June, 1890. The last animal was reported by the veterinary surgeon to have run amuck for four miles round Dover, and is known to have bitten on November 3rd two persons, one horse, seven dogs, one cow, and two lambs. The horse died rabid on December 22nd, and one dog on December 28th; and yet there is an agitation in Dover to withdraw the muzzling order. Further, during 1890 the medullas and spinal cords of two children have been received, whom I have proved by inoculations to have died of Hydrophobia. The case at Poole, from which the cord was sent to Professor Horsley by Dr. McNicol, also shows how children are exposed to the attacks of rabid animals. One day in September a strange black cat entered the room, and the child, a boy of 4½ years, followed it into the street to give it a piece of cake, when the animal bit his hand. The child died of Hydrophobia on November 19th.

Thus Rabies and Hydrophobia have occurred in seven widely-separated places within the triangle formed by Beverley, Poole, and Dover. These cases have all happened during the last nine months, and are only those from which material has been sent to the Brown Institution.

SCARLATINA IN THE COW.*

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THE investigation of 1885, which discovered a disease of milch-cows standing in causal relation to Scarlatina in man, was made public in 1886.† A period of excitement followed in etiological circles. Guests, admitted on presenting credentials too generously scanned, revealed themselves intruders; and science, offering a novel draught, saw it refused by some with shoulders drooped sentimentally, and utterance hysterically choked. In truth, reputations which had seemed secure were brought into danger by that research. Mr. Power had shown that an animal disease was in reality of great importance to mankind, which until then had been overlooked or thought of no consequence; that injured the veterinary body: while Dr. Klein, for his part, had named a new streptococcus discovered in Mr. Power's cows, *Streptococcus scarlatinæ;* and that aroused bacteriologists who had long talked about the micro-organism of Scarlatina, or even had actually sought for it without success.

A flying campaign was forthwith undertaken by both parties against the discoverers, in which the veterinarians were but indifferently led.‡ Their first step consisted in the familiar expedient of begging the question. They admitted that the Hendon cows were diseased; they even asserted that the kind of illness was quite common among cows—only, they boldly denied its connection with human Scarlatina. To illustrate a point which, it seemed to them, required no proof, reference was made to the daily experience of cow-keepers;§ and, to reassure the doubtful, the testimony of a gentleman was adduced who many years before had relinquished the profession of medicine for the milk trade.‖ The object of that proceeding clearly was to suggest that the milk of the Hendon cows was not infectious; another, executed by the same party at the same time,¶ was as clearly intended to suggest that it was infectious, although for another, and the customary, reason. They undertook a review of the public health of Hendon, and they laid stress on the undisputed circumstance that there had been some cases of Scarlatina there at the time the milk was spreading that disease. But the case they relied upon as being nearest to the milk was found, not in the person or in the family of an *employé* at the farm, but in a house some accurately measured hundred yards away, whence a little boy (himself not ill) used to stroll to the sheds on idle afternoons.** Apart from the self-contradictory character of this movement, it could be but an empty demonstration; for all that gave Mr. Power's position strength—all the varied coincidence he had revealed between use, disuse, and resumption of the milk of diseased cows, and outbreak, cessation, and recrudescence of epidemic Scarlatina among those who drank that milk—†† was ignored in it. A third manœuvre was performed by the leader himself; the Principal of the Agricultural Department, Privy Council Office, included in his account of the foregoing operations a contributed paper accusing the insufficient evidence on which spread of Scarlatina

* *The Practitioner* for February.

† Local Government Board, 15th Report of the Medical Officer.

‡ Report on Eruptive Diseases of the Teats and Udders of Cows in Relation to Scarlet Fever in Man. Professor Brown, C.B., Agricultural Department, Privy Council Office. With an Appendix. London, 1888.

§ *Ibid.*, No. 10; Professor J. Wortley Axe, Royal Veterin. College, London, *passim*.

‖ *Ibid.*, p. 67. ¶ *Ibid*, p. 68. ** *Ibid.*, p. 69. †† *L. G. B., op. cit.*, Mr. Power.

by milk had at some time or other been alleged.* Thus was confusion capped.

The bacteriologists set out upon similar lines, with all the assurance and fire necessary to tempt fortune. They asserted, and rather clamorously, that Dr. Klein had worked with the *Streptococcus "pyogenes,"*† without knowing it, and had renamed it *S. scarlatinæ* to his own confusion. Dr. Klein made a reply ‡ which was conclusive against this objection. He showed them that they were used to confound many diverse kinds of streptococci under the name "*pyogenes*." He reminded them how they had persisted in calling the *S. erysipelatosus* of Fehleisen (and of Rosenbach) "*pyogenes*," although the streptococcus of Ogston to which Rosenbach had given the latter name, because it produced abscesses, had no power to cause Erysipelas; while the *S. erysipelatosus* had no power to cause abscesses; § and how they had incontinently applied the same term to his own *Streptococcus* of Foot-and-mouth Disease although he had very fully described its cultural characteristics, and, above all, had shown that it and it alone could cause Foot-and-mouth Disease when inoculated in the sheep. ‖ At the same time he mentioned the characteristics of eight or ten streptococcus forms, and remarked that they might avoid some errors of description committed even by so expert a bacteriologist as Dr. Flugge, if they observed them. In short, all contention of this kind turns out on careful examination to be mainly verbal, although the subject in dispute lies in a field confessedly explored thus far only in part.

Rare glints of humour relieve these scenes, else full of melancholy in any reflective eye, when they are viewed at the angle of indifference. The only dignified figure in the drama remained for the most part withdrawn; Dr.

* *Agricult. Dept. Report, op. cit.*, pp. 85-97; by Dr. T. Whiteside Hime, M.O.H., Bradford. It may be reasonably asked whether a paper which covers thirteen close set pages can be adequately noticed in a single sentence. But, after careful winnowing, the matter is seen to stand thus:—The essay contains a thesis, a hypothesis, and evidence furnished by Dr. Hime's official experience. The thesis is, that the spread of Scarlatina by milk has been alleged (it would seem, always) on insufficient grounds; the hypothesis is that milk cannot (can never, it would seem) convey the infection of Scarlatina from man to man; and the evidence, drawn from an outbreak which occurred in Bradford, goes to show that in that instance the disease fell more heavily upon persons who consumed milk supplied from clean dairies than upon others who got milk from infected dairies. In a few concluding lines, however, the author explicitly throws his hypothesis overboard, and inevitably with it all the evidence—for the latter has logical connection with nothing else. The thesis alone remains, therefore, and to support that no attempt has been made.

† *Brit. Med. Journ.*, August 20, 1889, and May, 1889; *Agricult. Dept. Report, op. cit.*, p. 19, "Report on a Streptococcus Alleged to be the Contagium of Scarlatina in Man," by Professor Crookshank (and elsewhere).

‡ *L. G. B.*, 17th Report, Appendix B., Dr. Klein.

§ Professor Crookshank became the official exponent of this view (*A. D. R., op. cit.*); but he extended it to the point of declaring that all streptococci whatsoever are but of one kind, and that the merely septic. The instance cited in the text is chosen because he gives the reasons which lead him to declare Fehleisen mistaken; they are that the organism does not cause Erysipelas in certain rodents; and consistently, he calls that *S. erysipelatis* which others call *S. erysipelatosus*. But its title to a distinctive name is established by its effects upon man; in that animal it causes Erysipelas and nothing else. This has been demonstrated many times in cases of disease of kinds on which a casual attack of Erysipelas had been observed to act beneficially, and in which Fehleisen's streptococcus was successfully inoculated in order to produce an attack. (See Fehleisen's paper in *Micro-parasites in Disease*, and Flugge, *Micro-organisms*, etc., both in New Syd. Soc. Trans.)

‖ *L. G. B.*, 15th Report.

Klein interfered but once. Emissaries from the Agricultural Department appeared, scouring the country in search of fresh examples of the Hendon disease,* common in their experience: not clearly seen to travel, however, unencumbered by hope not to find human Scarlatina associated with it. For this reason (perhaps) they did not always see it, or anything like it, even when it fell under their eyes. Long afterwards, and—to fix a meaning on much-diminished type—in a casual manner, Dr. Klein noted † that cows at Enfield, suspected of spreading Scarlatina, were pronounced "free from disease" on veterinary authority, at the very time he was studying a teat-eruption which had run through the shed. He told of similar occurrences at Kingston and at Camberwell; and so forth, within limits that seem set only by the number of times his inquiries coincided with their visits. But it is not to be supposed, on the one hand, that Dr. Klein alone could see illness in these cases; on the contrary, his attention had always been first directed to them by others: ‡ nor, on the other hand, that the veterinarians wilfully kept their eyes shut. The latter have been exhibited a prey to panic, unable to design a rational plan of action. The truth is, that from the beginning they had recognised but one kind of teat-eruption in cows until Jenner discriminated variolæ vaccinæ from the rest; and that thereafter they had known but two kinds ("true" and "spurious" Cow-pox to wit) down to the present epoch,§ marked in this branch of knowledge—and marked a second time by one unnumbered in their own ranks.‖

Still, the veterinarians were not without company in this confusion, although indebted for it to a phantasy they were far from sharing. Jenner had divided teat-eruptions into two categories, and he quite reasonably named them "true" and "spurious" Cow-pox. The first, he declared, contained but one kind of eruption, and that specific; of the second he predicated nothing, except that it did not include the specific variolæ vaccinæ.¶ This, on the face of it, was a practical and a useful distinction: practical, in as far as it formally recognised the characteristics of variolæ vaccinæ, and pronounced them sufficient to mark off that eruption from every other; and useful, as giving peremptory check to the practice of including a number of different teat-eruptions under the one term "Cow-pox." In this light Jenner's distinction was regarded by the medical profession during a century. Then, a single dissentient arose; Dr. Creighton's sense of dialectical propriety was irritated by it. The consequences were felt in a book,** in relation to which the distinction played a merely catalytic part, after all; for nothing was made clear by it save that some can live for whom words and forms have all the cogency of facts and reasonings. The warranted statement is that the peculiar and

* *Agricult. Dept. Report, op. cit.* † *L. G. B.*, 18th Report.

‡ *L. G. B.*, 17th and 18th Reports.

§ But the following sentence (which is not at all modified by the context from which it here stands separate) extracted from the Report of the Principal of the Veterinary Department, Board of Agriculture (formerly Privy Council Office) for 1889, renders it doubtful whether pre-Jennerian views may not still be held in that Department; "the frequent occurrence of Cow-pox among cows in this country is well known to veterinarians and dairymen."

‖ The reader who cares to see the kind of writing on this topic that still passes current, may compare *Meat Inspection*, p. 119, "Pustular Fever in Cows and Ewes," by Professor Walley, Principal of the Royal Dick's Veterinary College, Edinburgh, 1890.

¶ *Further Observations on the Variolæ Vaccinæ;* reprinted in facsimile (together with *Observations*, etc., and *A Continuation*, etc.) by the Government of New South Wales, 1884, at request of the Hon. Dr. Makellar, the Hon. Dr. Creed, and Dr. George Bennett, F.R.S., p. 76; *cf.* Simon's *Papers relating to the History, etc, of Vaccination*, p. xiii.

** *Cow-pox and Vaccinal Syphilis*, 1887.

personal springs of its conception lie broadly open to readers endowed with the sense of humour even in a very feeble degree. But it presently appeared that all readers were not so gifted. When, in consequence of the research now noticed, attention began to be directed to the category of spurious Cow-pox in a practical way, Dr. Crookshank received an impulse from Dr. Creighton's writing. He took it *au grand serieux;* and that which had ruffled the admiration of a stickler for the nice distinctions of the schoolmen, and had caused in him (in the first place, at all events), a merely æsthetic rage, when it was introduced to a mind of different quality led to an ultimate result that was singular. To describe exactly how it was reached would involve a considerable digression; but, if limits of space serve to excuse the epigrammatic form, it may be said that Dr. Crookshank concluded by exhibiting himself beneath the statue* to the Friend of Mankind, in the bizarre character of Friend of Jesty.† In the meantime, however, he had been despatched by the Agricultural Department to inquire into an outbreak of teat-eruptions among a Wiltshire herd.‡ It is no longer worth while to dwell upon this amusing episode in the history of cow Scarlatina at length. Readers of negro folk-lore exotic in Southern States have a flashing view of it when they are told that fate decreed that the Department should encounter a "tar-baby," and chose Dr. Crookshank to construct it. It is enough to say, for the present purpose, that being there confronted with cases which belonged to the very category of "spurious Cow-pox," to name which had been deemed a title to scorn, he mistook them for examples of variolæ vaccinæ.§

An attempt has been made to furnish in brief space a just appreciation of the quality of Dr. Klein's critics, and of the kind of criticism that has proceeded from them, for readers whose occupation precludes them from much searching of blue-books and monographs. That the impression conveyed to some will be of sheer incredibility is not doubtful. It is the case, however, that one who attentively peruses the vague writings referred to becomes astonished and confused; and, when he turns from them to the logical and dispassionate record of Dr. Klein's experimental observations, that he feels restored confidence not much less keenly than the rescued castaway who walks once more the deck of a governed ship. But of this the reader shall judge for himself.

In March, 1890, the Medical Officer of the Local Government Board referred to the Hendon disease as that "which we now confidently recognise as *Scarlatina in the cow*."‖ What is the general character of the evidence on which that deliberate and emphasised opinion was expressed? It had gradually accumulated during four successive years of patient study; and accordingly under four divisions it may be summarised:—

1. That the Hendon disease was distinguished by a characteristic chain of symptoms; that it was inoculable from animal (cow) to animal (calf); that a streptococcus associated with the spontaneous disease showed constant cultural characteristics; that inoculation of subcultures of this organism caused in calves all the symptoms (except the teat-eruption) and all the pathological changes which were seen in the cows spontaneously affected, and all the symptoms, etc., seen in calves inoculated from the spontaneously-infected cows direct; that an organism which had all the cultural characteristics of that which was inoculated was recovered from the experimental calves; that the said organism was identical with the virus of the Hendon disease.

2. That from the bodies of human beings suffering from Scarlatina an

* Erected to Jenner by the French, in 1865.

† *History and Pathology of Vaccination*, April, 1889.

‡ *Agricult. Dept. Report, op. cit.*

§ *History and Pathology of Vaccination*; and *cf.* the text *infra.*

‖ Eighteenth Report.

organism was separated both during life and after death; that it possessed ten cultural and morphological characteristics which sufficed to distinguish it from every other known organism except that of the Hendon disease; that when calves were fed, and when they were inoculated, with subcultures derived from cases of human Scarlatina, and when they were fed, and when they were inoculated, with subcultures derived from the spontaneous Hendon disease, one and the same train of symptoms resulted, which was identical with that seen in the Hendon cows spontaneously affected, and in calves inoculated from them direct; that the same organism was recovered from both these sets of calves that was inoculated in them; and that it possessed the ten characteristics in both sets, and was identical.

3. That the teat-eruption, which was the only symptom of the spontaneous Hendon disease missing in the inoculated calves, was missing only on account of their age and condition; for when cows that had recently calved were inoculated with subcultures of the organism derived either from the spontaneous disease, or from human Scarlatina, they always developed the teat-eruption (as well as the other symptoms) observed in the Hendon cows.

4. That other examples of cow-diseases in which teat-eruptions appeared turned out on systematic investigation to comprise several distinct diseases. The instances were five in number, and having been discovered in Wiltshire, and at Edinburgh, Kingston, Camberwell, and Alderley (Gloucestershire) were provisionally so named. A laborious series of experiments showed that the Wiltshire disease was probably the same as the Kingston disease—that the Edinburgh was *sui generis*; that the Camberwell was the same as the Hendon; that the Alderley* was variolæ vaccinæ; and that these four, all marked by teat-eruptions of similar appearance, were specifically distinct, because while the Kingston, Camberwell, and Alderley diseases were respectively protective against second attacks of themselves, the Kingston was not protective against the Camberwell, nor was either protective against the Alderley. So far during the fourth year were the experiments carried.

And it is to be separately noted that Dr. Crookshank at first regarded the Wiltshire disease as identical with the Hendon, and later concluded that both were variolæ vaccinæ; but that three of his Wiltshire calves were successfully vaccinated with routine calf-lymph, for "we know that vaccine lymph will not take a second time on a calf that has previously been successfully vaccinated provided the second operation has been done, as in this case, a month after the result of the first vaccination has passed off." †

That is the sort of evidence on which the Hendon disease is now "confidently recognised as *Scarlatina in the cow*;" but if it be wished to appreciate its weight, and its true character, reference must be made to the original records. For no claim to infallibility is made on Dr. Klein's behalf: he himself pointed out long ago that his results could be tested only with co-operation of other observers who should repeat and vary his experiments. That such other observers must be competent, cautious, and diffident—in a word scientific, he did not say: but it must be understood; and all here pointed out is that very little work on the subject deserving of that epithet has, thus far, come to light.‡

* Used in routine practice at the Animal Vaccine Institute. See second *Report of Royal Commission on Vaccination*, Dr. Robert Cory's evidence.

† *L. G. B.*, 18th Report.

‡ Professor MacFadyean's (Royal Veterinary College, Edinburgh) experiments, which are given in the *Agricult. Dept. Report*, so often referred to above, are not overlooked; but they are open to serious criticism on many counts, of which it will be enough to mention here only two or three: (*a*) Omission to describe the illness of persons from whom it was sought to get infectious material is in this case important; something more than the reporter's opinion should have been furnished. (*b*) It

THE ALFORT VETERINARY SCHOOL.

WE regret to learn that Professor Nocard has been compelled, through ill-health, to resign the directorship of the Alfort Veterinary School. It is to be hoped that complete recovery is not far distant, as veterinary science cannot afford to lose such an able and successful investigator as Nocard, to whom we are indebted for so much of the recent knowledge we possess regarding contagious diseases. He is a member of the Academy of Medicine and Chairman of the Sanitary Police Commission, and is also a Fellow of the Royal College of Veterinary Surgeons.

By a Ministerial decree, Professor Trasbot has been appointed Director of the Alfort School.

THE RELATION OF DISEASES OF ANIMALS TO THOSE OF MAN.

WE learn that a prominent place will be assigned, in the discussions of the International Congress of Hygiene, which is to be held in London next August, under the presidency of H.R.H. the Prince of Wales, to the question of how far the diseases of animals are communicable to man, and *vice versa*. The subject has been very lately much in the air in consequence of Dr. Koch's recent discoveries, and the appointment of a Royal Commission to investigate the subject of tuberculosis. The Organising Committee of the Hygienic Congress have recognised the importance of the question by setting apart a special section for its discussion, and have been successful in associating with the section gentlemen of high authority in the medical, veterinary, and agricultural world. The section proposes to consider, amongst other subjects, the infectious, contagious, parasitic, and other diseases communicable from animals to man, and *vice versa*; the methods of the propagation of diseases affecting mankind by means of animals and animal products; the infection of meat, milk, and other comestibles; and the restrictions to be placed upon the sale of infected food and the movement of infected animals. On each of these questions papers will be obtained from the highest British and Continental authorities as the basis of the debates of the section, which promise, therefore, to be of very great interest and value. The President of the section will be Sir Nigel Kingscote, K.C.B., Chairman of the Board of Governors of the Royal Veterinary College; and the Vice-President will be Professor G. T. Brown, C.B., Director of the Veterinary Department of the Board of Agriculture, and Dr. E. Klein, F.R.S., Lecturer on Physiology at St. Bartholomew's Hospital. They will be assisted by a Council containing, amongst other members, Dr. Edward Ballard, F.R.S., of the Medical Department of the Local Government Board; Dr. Edgar Crookshank, Professor of Comparative Pathology and Bacteriology at King's College; Dr. George Fleming,

appears to be an indiscretion at least to use animals, in whom a first attempt to infect seemed to fail, for a second attempt slightly varied in experimental detail. (*c*) An unknown quantity was introduced into the experiments when shed epithelium was regarded as virulent. It is an open question at present whether it carry the virus; and if it do in what form? but if in spore form, what time and conditions are necessary to its development? and so forth. (*d*) In using blood, and fruitlessly, as the infective material, it is to be noticed that Dr. Klein has shown that the streptococcus is not present in every sample withdrawn for examination, and when present is but very sparsely distributed through that fluid. (*e*) In so far as Professor MacFadyean used subcultures prepared by himself (or others) from pure cultures of the *Streptococcus scarlatinæ* furnished (to him or others) by Dr. Klein, it may be granted that the virus of Scarlatina was inoculated, on this condition—that his failures to produce the Hendon disease with it shall be read in connection with such criticism on the general conduct of his experiment as is here suggested.

C.B., late Principal of the Army Veterinary Department; Mr. J. T. Reeves, representing the Worshipful Company of Grocers, which has for a considerable period made munificent grants in aid of scientific research; Professor James McCall, F.R.C.V.S., President of the Royal College of Veterinary Surgeons; Professor John McFadyean, M.B., B.Sc., F.R.S.E., Lecturer on Anatomy and Pathological Histology at the Royal Veterinary College, Edinburgh; Shirley F. Murphy, M.R.C.S., Medical Officer of Health for the County of London; Dr. J. Sanderson, F.R.S., Professor of Physiology at Oxford University; Sir John Thorold, Bart., Chairman of the Veterinary Committee of the Royal Agricultural Society of England; Dr. George Turner, Medical Officer of Health for East Hertfordshire; and Sir Jacob Wilson, one of the Governors of the Royal Veterinary College.

The secretaries of the section are Mr. W. Duguid, F.R.C.V.S., Assistant-Inspector of the Veterinary Department of the Board of Agriculture; Dr. G. Sims Woodhead, F.R.S.E., Director of the research Laboratory of the Conjoint Board of the Royal College of Physicians and Royal College of Surgeons; and Mr. Ernest Clarke, Secretary of the Royal Agricultural Society of England, to the last named of whom communications relating to the section may for the present be addressed, at 12, Hanover Square, London, W.

THE CENTENARY OF THE ROYAL VETERINARY COLLEGE.

(From the *Daily Telegraph* for February 7th.)

ATTENTION has just been called to the fact that during the present year the Royal Veterinary College will celebrate the centenary of its foundation in 1791, without the addition, however, of any suggestion as to the best method in which such an event can most appropriately be commemorated. The Royal Veterinary College is one of those modest English institutions which have done good work in their day, and deserve to have the centenary of their birth celebrated in an unostentatious fashion. Mr. Gladstone once remarked, when returning thanks at a public dinner given by the College of Physicians, that within his memory there was no art or science which had made such unparalleled advances as that concerned with therapeutics. It may fairly be doubted, however, whether the treatment of the human body in disease was not better understood—let us say in 1830—than the veterinary art which takes cognisance of the maladies of horses and other animals. Turning to the books on the latter subject which appeared towards the beginning of the present century, we shall find that, with the exception of profuse bleeding and violent cathartics, the groom farriers of George III.'s and George IV.'s reign were as ignorant as the poor beasts subjected to their murderous lancets. The most successful veterinary surgeon of his day was Mr. William Taplin, of Brighton, whose works went through an enormous number of editions, and were said to be the only books that Sir John Lade, of coaching fame, and his Royal friend and patron the Prince Regent, ever opened. It was well known to William Taplin that "an incredible number of horses fell victims every year to the invincible self-confidence of those rustic sons of Vulcan, self-denominated farriers, whose only idea of healing is to blend purgatives and restringents, mercurials and antimonies, into one indiscriminate mass, and to administer it in boluses to their suffering quadrupedal patients."

The Royal Veterinary College had but a humble beginning. In 1788 a certain Monsieur Charles St. Bel, so-called after his native village in France, whose real name was Charles Vial, arrived in this country as a refugee. His ostensible design was to establish here a veterinary school on the model of that which had attained no inconsiderable success and celebrity at Altorf, in France. Unfortunately, the interest of the British public in the maladies of

horses was of the faintest and feeblest kind. Monsieur St. Bel was very coldly received, and all his efforts to awake sympathetic attention to the sufferings of the poor animals that he watched in the streets of London proved abortive, until, fortunately for him, an incident happened of which he was not slow to avail himself. On February 28th, 1789, Eclipse, the most celebrated race-horse ever bred in these Islands, died at Cannons, near Edgware, in the twenty-sixth year of his age. The famous old horse had been moved from Epsom to Cannons in a machine or van constructed for that purpose by order of Colonel O'Kelly, whom Eclipse and his sons and daughters had made rich. The Colonel died in 1787, leaving Eclipse and Dungannon, and all his best brood-mares, to his brother Philip, with strict instructions to part with none of them, but to keep them for breeding purposes. It is not a little remarkable that towards the close of last century and at the beginning of this there was no more popular print in London than that of "The Grave of Eclipse in Cannons Park." The great horse was represented—as he is in the preface to Mr. George Tattersall's "Pictorial Catalogue of English Racehorses"—to be lying under a mound overshadowed by a weeping willow. Any lover of the horse who now repairs to Cannons will find, however, that all record of the spot has passed away. In 1789, when Eclipse died, Monsieur St. Bel saw immediately that his much-coveted opportunity had come. He applied to Mr. Philip O'Kelly for permission to make an autopsy of the noble beast's carcase, and lost no time in publishing an "Essay on the Proportions of Eclipse." In this prolusion M. St. Bel mentions that in the morning of February 25th, 1789, Eclipse was seized with a violent colic, the result of inflammation of the kidneys and bowels, of which he died two days later. "It is worthy of notice," he added, "that Eclipse's heart weighed fourteen pounds. The skull was not opened, as it was my desire to preserve the skeleton of so famous a horse." In this "desire" he was disappointed, as the widow of Colonel O'Kelly—a lady not without a curious history, which she gained as Miss Charlotte Haynes—who was the owner of Cannons Park, insisted upon her husband's old favourite being buried in a spot selected by herself. Sixty or seventy years since it was often pointed out by the coach-men who piloted the Edinburgh and Glasgow mails along the Great North Road; but, although the grave of Eclipse is now unknown, the memory of the great horse still lives in the pedigrees of many of his descendants. No one had better reason for blessing Eclipse than Charles Vial de St. Bel, whom the sire of three hundred and forty-three winners brought for the first time into notice. The "Essay on the Proportions of Eclipse" attracted the attention of the Prince Regent—the result being that on April 8th, 1791, it was deter-mined to found the Veterinary College of London, Camden Town, with M. de St. Bel for its chief Professor and teacher.

The first President of the new institution was the Duke of Northumberland, and among its seventeen Vice-Presidents were included some of the most eminent London surgeons and physicians of the day, not omitting the celebrated John Hunter who died in 1793. M. de St. Bel did not survive long enough to benefit materially by the growing success of the institution which he founded, and which in or about 1796 received the patronage of his Majesty George III. The successor to M. St. Bel as Professor of the Veterinary College of London was Mr. Coleman, who in his work on the "Foot of the Horse," speaks of the College as having supplied "most of the regiments of regular cavalry in England with veterinary surgeons." When the College was first styled "Royal" is uncertain; but it was probably under the Presidentship of the Duke of Kent, to whom succeeded in turn his brothers, the Duke of York, the Duke of Clarence, and the Duke of Cambridge, whose son, the present Com-mander-in-Chief, now holds the same office. A Charter of Incorporation was granted to the Royal College of Veterinary Surgeons by her Majesty in 1844,

and from this source are drawn all the ablest officers of the Army Veterinary Department, with Mr. George Fleming, C.B., at their head. In the early days of the Royal Veterinary College, Parliament contributed a small annual grant towards its maintenance; but since 1820 it has had to depend on its own resources. "In conclusion," writes Major Lawrence Archer, in his book on "The British Army: its Regimental Records, Badges, and Devices," "it may confidently be asserted that in no other Army are the veterinary officers so severely tested, physically and professionally, as in ours, seeing that one-half of their service is foreign and much of it in unhealthy climates. Moreover, veterinary surgeons in the field are not protected by the Red Cross, but are regarded as combatants and therefore equally exposed. Their services correspond with those of the cavalry." Upon this we may remark that in war no Red Cross "protection" avails to keep an Army surgeon of any kind out of danger. Much to their honour, the regimental or brigade surgeons may be seen wherever the officers or men under their charge are lying wounded; and the courage and devotion displayed by them, often under heavy fire, as they perform operations and extract bullets, is worthy of the highest commendation. Perhaps the best illustration of the advance of veterinary science was afforded in 1875, when Picnic, who had broken his leg during the previous year, but was suspended in slings for months by his trainer, Thomas Jennings, ran second to Camballo for the Two Thousand Guineas. In olden times it was the uniform practice to put an animal to death by the aid of what was always called "the merciful bullet" if he broke a limb in running a race. That was the fate of Leander when his leg was fractured by his fellow-culprit, Running Rein, who was also a four-year-old, in the memorable Derby of 1844. In like manner the celebrated Yorkshire mare Nancy was buried on Chester race-course after she had broken her leg when running for the Chester Cup. Nowadays her life would certainly have been spared, and she might have lived to be worth thousands of pounds as a brood-mare. It is but necessary to read Mr. Fleming's "Veterinary Science: a Sketch," to perceive what progress the art in which he is so skilled has made since the foundation of the Royal Veterinary College in 1791.

THE SHOEING OF HORSES FOR MILITARY PURPOSES.*

BY GEORGE FLEMING, C.B., LL.D., F.R.C.V.S., PRINCIPAL VETERINARY SURGEON.

An apology would appear to be almost necessary for now venturing to introdone such a subject as the shoeing of Army horses; inasmuch as it may seem to many to be of too trivial a character to merit notice among the many importa nt topics, which should be and are, brought here for observation and discussion. If any apology is needed, I would remind those who may imagine that such a matter as this is undeserving of the attention of all who desire, or who are occupied with the efficiency of the Army, that nothing in the way of details can be neglected in order to ensure thorough efficiency; and, in fact, that this rests entirely on details, the completing and perfecting of which must not be trifled with or ignored. Neglect of even one of them, and that perhaps, apparently, the most insignificant, may entail serious results, as the history of warfare amply testifies; and the immense importance of giving heed to every item upon which efficiency depends is well illustrated in the old Spanish proverb, which is pertinent to our subject: "Por un clavo se pierde una herradurra, por una herradurra un Cavallo, por un Cavallo un Cavallero." Or, as Benjamin Franklin puts it: "For want of

* A lecture given at the Royal United Service Institution, General Sir C. P. Beauchamp Walker, K.C.B., in the chair.

a nail the shoe was lost, for want of a shoe the horse was lost, and for want of a horse the rider was lost, being overtaken and slain by the enemy (another version adds, that by the death of the horseman a city was lost); all for want of a little care about a horse-shoe nail."

But those who have had experience with mounted corps in the field, will be ready to agree with me that, the shoeing of Army horses is very far from being an unimportant or trifling matter, and that it sometimes makes itself a very prominent one, and one demanding much anxious care and attention. It is from this point of view that we shall to-day examine it; and I am hopeful that you will be able to arrive at the satisfactory conclusion, that among the many improvements which have been effected in recent years in the condition of the British Army, as a fighting machine, the shoeing of horses may justly be included.

You will not expect a historical dissertation upon an art, which, humble though it may appear, has yet had, indirectly, a vast influence upon the destinies of mankind, in lending its aid to the restless wave of human action in the evolution of civilisation. For it must be admitted that, without this humble handicraft, the value of horses would have been very small indeed; and the world without the full development of this animal's powers would have made but little progress.

The varied uses to which the horse has been subjected, since taken from a wild state, and the willing and cheerful manner with which he has undergone fatigue—performing duties which are, one would think, quite foreign to his nature, have all been owing to his combined and unequalled qualities of strength, courage, speed, fidelity, and obedience; but though his great value depends essentially upon a just disposition of these, yet more especially is it as a living machine, capable of moving or producing motion, and communicating it to all inert masses at all times and in nearly all situations, that he is to be prized.

The history of mankind abundantly testifies that every possible use has been made of the horse, whether in war, commerce, or pleasure; and the most ancient nations were as cognisant of his value as the most modern—proving the early sense and conviction of his importance. Those old-world nations which, long ages ago, most largely employed the horse, were the great centres of antique civilisation; and it may be safely asserted that without him the human race could not have reached its present state of advancement and refinement, or have been able to contend against the numerous obstacles to the comfort and happiness which it now enjoys. Indeed, it has been said that next to the want of iron, the want of horses would have been, perhaps, one of the greatest physical barriers to the advancement of the arts of civilised life.

In the deployment of his good qualities, as a motor especially, the horse must rely upon the integrity of his feet in weight-sustaining and weight-propelling, and to maintain these parts strong and sound has been the object of horsemen from the earliest times—from the days of Xenophon—up to the present year. The aphorism of "No foot, no horse," was as obvious to ancient as to modern people, and unless his wonderfully-constructed feet are maintained in a healthy condition, he is indeed valueless to man.

In a state of nature the hoof requires no protection, as its growth is sufficient to meet the demands of wear. And in certain parts of the world, the animal can even perform a fair amount of work without recourse to shoeing, But this is where the climate is dry, and the soil soft and elastic, and where horses, firm and wiry in themselves, have dense, tough hoofs. Domestication and climate, no less than soil, have an immense influence on the hoof-horn; and horses brought from countries in which shoes can be dispensed with, to those which are moist and stony, or which have artificial roads, are no

more exempted from the necessities for hoof protection than the animals native to these regions.

The necessity for preventing injury to horses' feet from undue wear of the hoofs must have presented itself at a very early period to equestrian races, especially in unfavourable situations or humid climates; and though some kind of protection may have been introduced, yet it is only at a comparatively recent date that we find any mention of the present method of shoeing. True, some of the Roman writers allude to a kind of sandal made of sparteum, something like the horse-sandal of rice-straw used by the Japanese until a few years ago; but there is no written evidence that an iron plate, attached to the hoof by nails, was known to either Greeks or Romans. Some years ago I was induced to undertake an investigation into the history of horse-shoeing, and the result, given in my work, entitled, "Horse-Shoes and Horse-Shoeing" (London, 1869), was that this art must be of great antiquity—probably extending beyond the Christian era, if the evidence afforded by a coin of Tarentum can be accepted.

Shoes of iron and bronze have been found with Gaulish remains at Alesia and elsewhere on the Continent of Europe; and in this country they have been discovered with Celtic and Roman articles which clearly indicate their remote age, and go to prove that among the Gauls and ancient Britons, horses were shod in much the same way as they are nowadays.

These shoes, no matter from what source they were obtained, I noticed were small, indicating that the horses of those days were not much larger than ponies or small Arabs; they are remarkably uniform in shape, being narrow and light; on each branch there is a calk, and a peculiar and typical feature is their undulating outer border, due to the three large cavities on each side, intended to receive the base of the immense nail-heads which projected for some distance above the level of the shoe. These nail-heads and the calkins secured a good foothold for the animal; and, altogether, the horsemen of that time had a better notion of shoeing, and of preventing horses slipping, than would appear to be the case nowadays.

It is probable that shoeing was introduced, or first practised, by the Gauls, and that their priests, or Druids, were the shoers and armourers. The strange superstitions which still attach to horse-shoes, and the legends connected with them, and the *faber ferrarius*—Wayland Smith and other mythical personages of Northern and Western Nations—would point to this. In Wales, long before the Norman invasion, the shoer was an important personage at Court, and enjoyed great privileges because of the importance of his art; and at the French and German Courts he was a high noble, with a designation from which is derived the title of Marshal. In France at the present day the shoer is still known as the *Maréchal ferrant;* in this country the names of Marshal and Ferrers are significant of horse-shoers; while horse-shoes formed Coats of Arms of families and Corporations, and during the Middle Ages the art of shoeing appears to have occupied a very elevated position indeed.

The simple but sensible shoeing of the pre-Norman times was followed by a more complicated and clumsy style with the introduction of large horses, clad, like their riders, in heavy armour; and when the anatomy of the animal began to be studied in the 17th and 18th centuries, extraordinary notions began to prevail with regard to the functions of his feet—notions which, carried into practical effect, have been the cause of serious injury, even up to the present day.

It is needless to mention that, in early times, shoeing was chiefly resorted to for military horses; oxen, mules, and asses being mainly employed for draught and agricultural purposes in civil life.

Mistaken ideas as to the functions of the foot, and especially of its protec-

tion—the hoof, led to the latter being considered as something inimical to the animal's welfare; it was therefore barbarously mutilated, and only too often is so yet outside our Army; while the shoe attached to it was clumsy and damaging in the extreme.

The sole was unmercifully cut away until the blood was sometimes oozing through the horn, the frog—considered too sensitive to come into contact with the ground, and being soft and easy to incise, was artistically carved to please the fancy of the shoer, or the horse-owner, or groom; while the wall, the most essential portion of the hoof, was perforated by far too many nails, and rasped and beautified until there was frequently little of it left to which the shoe could be fastened. The shoe itself was made to correspond with the fantastic and utterly erroneous ideas prevalent with regard to the physiology of the foot. It had to be made heavy and broad in order to cover the tender sole, and as this could not bear any pressure from the shoe after being denuded of its natural protection, the horse's weight had to be supported on the margin of the hoof. Consequently, there was a space between the shoe and the sole, while the ground surface of the shoe itself, being wide and plane, was well adapted for slipping. This narrow bearing of the shoe on the foot, the space between it and the sole, and the cumbersome weight of the shoe itself, necessitated a great number of nails to keep it firm on the hoof—a result seldom attained, especially in heavy ground, where the suction readily tore it off, and with it generally a large portion of the wall.

The shoer's art was overdone, and to shoe a horse whose hoofs had undergone such barbarous treatment at his hands required a great amount of skill and time; and even then the animal was only too often crippled by nails driven too near or into the quick, or by the shoes being fastened too tight on the morbidly sensitive foot.

For some years a much more rational system of managing the hoof has prevailed in the Army, owing to the shoeing being placed under the superintendence of the veterinary officers, who had not the ignorant prejudices of grooms and others to contend with, as had their colleagues in civil life. The excessive mutilation alluded to was not allowed, and the hoof-horn was looked upon as the natural protection of the foot, not as something alien to it and which must be cut away.

But until six or seven years ago, the Army horse-shoe was still faulty in shape, in being plane on the ground surface, and bevelled on that next the sole; so that the weight of the animal was borne on the margin of the hoof only, a cavity existing between the sole and shoe; consequently, the foothold was very insecure, and the connection between shoe and hoof was comparatively slight, especially on heavy ground. And until the last three years, the farriery arrangements of the Army were faulty in the extreme, and quite unsuitable to meet the demands of war service—indeed, they scarcely sufficed for the requirements of peace. The shoers for very many years contracted with the Government to shoe the horses, receiving a certain sum—latterly a halfpenny a day for each horse; this in itself was bad, as it led to abuses. For this sum the shoer provided the shoes, nails and tools; and as he had to make the two former, it took all the time of the sergeant farrier and shoeing-smith to keep a troop of cavalry horses—about forty—tolerably shod. A man required generally about three years' training before he could make shoes and nails, and shoe a horse fairly well; but it must be confessed that the shoeing was often very unsatisfactory, and it was impossible to obtain anything like uniformity. Not only this, but after men had been carefully trained, they not unfrequently took their discharge, as such occupation in civil life offered better prospects than the Army did.

Owing to the long time required to teach shoers, there were very few men in cavalry regiments, beyond those actually employed in the forges,

who could shoe; in fact, it was sometimes very difficult to keep up the number necessary to maintain the horses in an effective state in peace-time. Consequently, there was no provision for war, and in the Crimea—which was a vast standing camp, with no marching—the trained shoers were soon expended, and had to be replaced by the waifs and refuse of the civilian forges. It is not easy to realize the condition our mounted forces would have been in, had there been any marching.

The introduction of short service rendered matters still worse, as there was not then sufficient time to properly train even the number of shoers needed for peace requirements—the demands of drill and other branches of a soldier's instruction making a serious inroad upon the comparatively brief period men were engaged for.

The unfortunate state of the farriery organization existing at that time was well exemplified in the Egyptian campaign of 1882. The cavalry regiments were sent from this country with the ordinary complement of farriers for the actual requirements of each troop, scarcely any being in reserve. The marching was trifling and the campaign brief; yet, at the end of a month, one regiment—the 7th Dragoon Guards, which had left England with seventeen farriers — was telegraphing home for more to be sent out at once, as the number was nearly expended, and the horses could not be shod. Unluckily, the regiments at home had no farriers to spare, so none could be sent to Egypt without causing these to be short of their complement. Not only was this want of shoers experienced in the cavalry, but the other mounted branches were little better off; while the Regimental Transport horses in Egypt were in a sorry plight. It was reported that many of these returned to England, after several months' absence, wearing the same shoes which they had on their feet at their departure, and which had never been removed. The Principal Veterinary Surgeon of the expedition stated that "Infantry regiments, being unprovided with shoeing-smiths, their transport horses and mules were constantly left unshod, except when a man from the Commissariat or one of the mounted corps could be obtained. The feet of the animals were therefore very frequently in a bad state." It was very fortunate that there was little marching, or the results might have been something akin to disastrous.

That campaign demonstrated, in a most unmistakable manner, the urgent need there was for amending or reorganizing the farriery system of the Army, so as to enable it to meet the altered circumstances of the times; and this task was the first imposed upon me on becoming Chief of the Veterinary Department. In my Annual Report for 1886, the scheme of reorganization I had proposed in 1883 is alluded to in the following terms:—

"It has for many years been evident that the system of farriery existing in the Army had become obsolete, and could no longer meet the demands even of peace service. In the field it always broke down in a few weeks, and there was the greatest difficulty in keeping horses shod—a difficulty which was only partially met by engaging large numbers of civilian farriers, as during the Crimean War (men who were of little use, being the refuse of the shoeing forges of large towns); or by denuding the mounted corps at home of their farriers, which occurred only so late as in the Egyptian campaign of 1882. The introduction of short service into the Army made the defects of the system all the more evident.

"During the long-service period, when men served for many years, there was ample time to train farriers to make horse-shoes and nails, and to shoe horses; though even then it was impossible to secure uniformity in shoeing throughout the Army, it being good in some corps and sometimes very bad in others. And it generally required at least three years to teach a fairly intelligent man to become a good artizan; so that in each troop of cavalry, in

addition to the sergeant farrier and shoeing-smith, there was always a man in training, being three men to shoe about forty horses. Owing to this large proportion of men, much trouble was often experienced in obtaining soldiers for training, and especially as the shoe, and nail making, together with the shoeing of the horses, occupied nearly all the time of the farriers, and left scarcely any for other regimental duties. Hence, as a rule, there were no spare shoers in the ranks; and on active service, the farriers being in the fighting line and exposed to all the risks of the other soldiers, *plus* the fatigue of shoeing the horses while their comrades were resting, they were the first to succumb, and there were no others to replace them.

"With the introduction of short service, it was found impossible to allow three years to be devoted to training in farriery, when so much of the brief period had to be spent in drill and other instruction necessary for men of mounted corps; so that for some time there was the gravest difficulty in keeping the horses shod at all when in barracks, while there was an utter breakdown in Egypt in 1882, though the campaign was very short, and there was but little marching.

"To remedy this serious state of affairs, it had been suggested that there should be a special corps of farriers formed, and that men from this should be attached to regiments. But a very brief consideration sufficed to show that this proposal would meet with the strongest objections, not the least of which would be the heavy expense it would entail; and, besides, when carried into execution it would lead to dissatisfaction, and fail to meet all requirements."

The introduction of machine-made horse-shoes and nails a few years ago fortunately enabled me to devise another plan, which has none of the disadvantages and objections that would attend the institution of a Farriers' Corps, and which, while allowing us to provide a large and sufficient number of shoers in corps to meet the demands of war, simplifies and improves the art of shoeing, ensures uniformity throughout the Service, allows of more men for regimental duty, and increases the efficiency of the horses while at work, by affording them a better foothold (owing to a new pattern of shoe), at the same time maintaining their hoofs in a strong healthy condition.

This reorganization consists—

1. In abolishing shoe and nail making to the extent of three-fourths of the supply required, the remaining fourth being made by the farriers merely in order to keep them in practice; the three-fourths to be machine-made shoes and nails, all ready for immediate use. In recommending the discontinuance of shoe and nail making in the Army, I was only acting on the knowledge which everyone who has had experience of field service in mounted corps is possessed of: that it is impossible during a campaign to make shoes and nails, and that it is generally a matter for congratulation if the horses can be kept effectively shod when these articles are provided for the farriers. The absurdity of sending iron and coal into the field with which to make horse-shoes will be apparent, when it is stated that it requires 15 lbs of coal and about 6 lbs. of iron to make a set of shoes which, when ready to put on the horse's feet, will weigh only about 5 lbs. Then the manufacture of shoes in the field necessitates a lumbering field-forge with its heavy tools, drawn by two, four, or even six horses (as in Egypt, though that number was not always sufficient, as some of the forge-wagons were left behind imbedded in the sand); and lastly, there is the time, the men, and the labour required to make the shoes. If it is highly inconvenient or impossible to make shoes on active service, then, even if short service allowed it, it must appear a waste of time and trouble to attempt to teach men to do this during peace, if all instruction of soldiers should be with a view to their effectiveness in war.

2. In having a number of men in the ranks taught to *put on* shoes as on active service, the number to be at least 10 per cent. in mounted corps; besides the sergeant farrier, and a reduced number of shoeing-smiths in training for the grade of sergeant-farrier. This number of men will afford a good reserve of shoers, and as any man of ordinary intelligence can be taught to shoe sufficiently well in about three months, there ought to be no difficulty in keeping up the percentage.

3. In the sergeant-farrier, instead of wasting his time, as formerly, in shoe-making, being now an instructor of men in shoeing horses with ready-made shoes; while, at the same time, having been specially trained at the Army Veterinary School, he can join a Field Veterinary Hospital Staff at brief notice, without causing any inconvenience to his regiment, as the shoeing can be carried on independent of him. The men, when trained to put on shoes, return to the ranks until 10 per cent. are taught, when they come back to the forge, in turn, for a certain period, to shoe the horses, and thus keep up their practice.

4. In having two men per battalion of Infantry, and a certain number of Marines, taught to shoe horses. The necessity for this measure is evident, as the requirements of Mounted Infantry and regimental transport have hitherto had to be met, when possible, by lending them Cavalry or Artillery farriers. But sometimes these could not be spared, and then the horses were left uncared for, so far as shoeing was concerned.

Official sanction to the proposed scheme had been anticipated, and instruction was commenced some time ago, and is now carried on as energetically as possible.

The machine-made shoes are so well-shaped and finished, and are made of such excellent iron, while the nails are so perfect and easily driven, that the labour of shoeing is immensely lightened and shortened, and men are soon taught. A moderately expert man can shoe a horse in half-an-hour, and it has been done in less than twenty minutes. On this system and during an emergency, a shoer might easily keep 150 horses shod all the year round.

Another feature of the reorganisation is the abolition of the contract system formerly existing between the Government and the farriers. This had for long worked badly, and its cessation will be advantageous to the public. I have estimated that, in the matter of cost alone, the adoption of the proposed system will effect a saving, in the Cavalry only, of about £4,000 annually. But the problem of a farriery organisation which will give a large number of skilled Veterinary Hospital assistants, and a supply of shoers sufficient to meet the demands of mounted corps and infantry during a long campaign, will, I hope, be solved when the scheme is fairly in operation. And even did it cost more, instead of less, than the late most defective system, this would be as nothing when compared with the benefits which will certainly be derived from it, especially on active service.

The question of mobility has not been overlooked in considering the subject of farriery. I had suggested that, for cavalry, the heavy forge and forge-waggon should be dispensed with, and a small portable forge (weighing about 200 lbs.) be issued instead, one of these to each wing of a regiment. This forge can be carried on a pack-saddle and will meet all the needs of the shoers; indeed, with the new form of shoe a forge will rarely be required, as nearly all alterations in shape can be effected without heating it. The experience gained in the expeditions to Suakin and Bechuanaland testifies to this.

The introduction into every-day service of shoes and nails ready for immediate use has another advantage, which must not be overlooked. On every campaign since I entered the Army, serious complaints have been made as

to the manner in which the store department issued these articles; sometimes they were deficient in supply, but more frequently, perhaps, they were issued in wrong sizes to corps, and there was generally delay and confusion; while occasionally, the pattern, or the material of which the shoes or nails were made, was very defective. These faults were owing, in great measure, to store-keepers being unaccustomed to issue such articles in peace-time, and being therefore unacquainted with them; and to the shoes and nails being kept in store without being properly examined or tested before they were sent into the field.

By the constant issue of horse-shoes and nails from store in ordinary times, the issuers will be experienced in this important duty; while the pattern and material of the articles will be always under trial, and necessary improvements can be effected as the trial progresses.

Such was the reorganization I proposed, and I am pleased to say that, after ample trial, it was adopted, and came into operation for the whole of the cavalry in this country, in April, 1888. It is now being tried in some batteries of artillery, with a view to its adoption in that arm, and it is also undergoing trial in the Army Service Corps and Royal Engineers; while it is altogether practised in infantry transport.

This "cold system" of shoeing, as it is termed, in contradistinction to making shoes and fitting them to the hoof while hot, has proved a great success on active service. In the report of the principal veterinary surgeon with the Suakin field force, in 1885, we find the following allusion to it: "The horses and mules were kept fairly well shod up during the campaign, and the shoeing was, on the whole, good." "The system of 'cold-fitting' was, on my recommendation, generally adopted, and the new pattern machine-made shoes and nails were used, as far as was practicable, especially among the lighter horses. The superiority of these shoes over those of the old pattern has already been clearly demonstrated by the late experiments in the United Kingdom, but I believe this is their first trial on active service. Their principal advantages appear to be:—(1) the ease and celerity with which they can be fitted cold; (2) the superior quality of the iron; (3) their lightness, durability, and finish; (4) the fact that the heavy field forge, with the fuel and plant for shoe-making, can be dispensed with—the small pack forge being merely necessary in the few cases where heat is required. The immense advantages of the latter, especially in a campaign in the desert, where wheel-transport is impossible, can readily be understood."

Quite recently, the Inniskilling Dragoons severely tested the system while on active service in Zululand, and the following extracts are made from the report of the officer commanding that regiment. He says: "The regiment having been on field service in Zululand, during the last six months, the new regulations as regards cold-shoeing could not be carried out in every particular; though, as far as was practicable and possible, every effort has been made to act on and carry out the instructions issued. Shoeing the horses with cold shoes has been done most fully, and I think, very successfully. . . . . In a standing camp there can be but little difficulty about the details of the system being carried out in their entirety. The material of the shoes is excellent, and if they are gently heated by slight blows from the hammer, they can be opened out or otherwise altered in shape, so as to fit the foot, without injuring the shoe; though if they are opened out before being treated as above, they nearly always break at the toe. This arises from want of care on the part of the farriers, and will always be the case unless caution is exercised. . . . . The nails are of good quality, well made, and carefully finished.

"Owing to the regiment being in detachments, and constantly on the move from one place to the other, the horses were all shod with the ready-made

shoes and nails supplied for the cold-shoeing, none being shod with the hand-made shoes and nails; as it was an impossibility, under the circumstances, to make them. . . . The shoes and nails are durable and last well.

"The conditions of service under which these shoes were used were exceptional, as the troops were on field service during the whole period. The shoes, therefore, were tried under severe conditions, and I consider that they bore the trial satisfactorily."

I may remark that the shape of the new pattern shoe conduces to—(1) solidity of attachment to the hoof, with fewer nails than were required for the old pattern; (2), security of foothold; and (3), soundness of the foot. The first and third points are secured by the upper or foot surface of the shoe being flat, which gives it a wide, solid bearing on the wall and margin of the strong, unmutilated sole, leaving no space between for the lodgment of stones or mud, as was the case with the old pattern, and therefore obviating the necessity for a hoof-pick; and the second advantage is gained by the concave ground surface of the shoe, which gives a grip in soft soil, and diminishes the slippery surface on hard ground. These advantages are of great importance to army, as well as to other horses; and not less are those related to preserving the foot and limb in their integrity, and which are ensured by the new system of shoeing. Particular attention is paid to keeping the hoof in as strong and natural a condition as possible; so that the art of shoeing is reduced to its primary object—the protection of the hoof from undue wear, while it is simplified to the utmost.

Though the system has been only about three years in operation, nearly 500 men have been trained in "cold shoeing"; of course, many of these have taken their discharge, while a considerable number have gone into the Reserves, and it may be hoped that they will be available when required. At present there are 380 men in the ranks who are competent to shoe, and 166 are in training; at the same time, the regular shoers in the forges are up to the regulation number. In infantry battalions there are 206 trained men. These numbers will be added to every year.

The adoption of this system of shoeing has permitted us to introduce another most beneficial novelty. By simplifying the shoeing and allowing it to be carried on by these extra men, the sergeant farriers, and those who are in training for this grade, are enabled to attend a special course of instruction at the Aldershot Veterinary School, so as to qualify them to act as veterinary assistants. The urgent need that existed for men trained with this object has often been alluded to by general officers in command of troops on active service; as the losses among animals have been greatly increased from the absence of skilled attendance on the sick and wounded, either on the line of march in the field, or in the veterinary hospitals. Veterinary officers are too few in number, generally, to give the sick and injured animals all the attention they require, and until lately the difficulty in obtaining men, even unskilled, to aid them has been almost insuperable. So late as 1882, during the Egyptian campaign, a base hospital was attempted to be formed, but the principal Veterinary there reported that the cavalry officers "disliked parting with their men for hospital work, and each battery was of course unable to spare its only farrier. At last a farrier-major of the 4th Dragoon Guards was obtained, but for some time he had scarcely any men to assist him."

It was not until the dispatch of troops to Suakin and Bechuanaland in 1885, that trained farriers could be furnished for this purpose. Up to that time veterinary officers had no proper assistance in their arduous duties in the field, and especially in the field hospitals. Beyond a chance farrier, who perhaps had no training at all, there were no men for the duty. Consequently, animals did not receive that care in having their wounds dressed, or their

recovery from sickness or debility attended to; the losses and delays in recovery were therefore all the more considerable.

A number of farriers specially instructed in the Aldershot Veterinary School accompanied the expeditions to Suakin and Bechuanaland, and the benefits derived from their services were strongly dwelt upon in the reports received at home. And the advantages in having such assistance will be even more marked in future expeditions, as the organisation under which it is created has not yet had time to become perfected. It has been decided that all the sergeant farriers who possess a third-class certificate of education shall attend this course of instruction at the Veterinary School; in addition to these, it is desirable that as many men as possible who possess the same educational certificate, and who have been passed as competent to shoe horses, should also attend the school for the same purpose, so as to fill up vacancies among the sergeant farriers during peace or in the field. With the view of meeting the demands of mounted infantry and regimental transport on active service, it has, as already mentioned, been decided to teach two men per battalion of infantry to shoe horses, and when so instructed the most intelligent of the two is to undergo the above course of special instruction. The Royal Marines are to be included in this scheme. After attending the school, these men, of course, return to their corps.

In anticipation of the adoption of the new farriery, reorganisation steps had already been taken in this direction. Indeed, since 1883 the system of training referred to has been in operation.

Up to the end of last year 568 men had obtained the school certificate of competency, and the names and corps of these are entered in a register kept in my office, and in another in that of the Adjutant-General, any changes occurring being reported every month; so that we may know whether the men are with their corps, in the reserves, or non-effective.

By this means we shall be able to lay our hands at once, in case of war, upon a large number of well-trained intelligent men, to form what may be called a "Veterinary Hospital Staff," whose duties will be similar to those of the Army Medical Staff Corps; and, in addition, they can be utilised in the Remount Depots, and assist in the supervision of animals on the lines of communication, in order to prevent those injuries and losses which are usually so heavy there. When not required for these duties, their special training will be most advantageous to their own particular corps.

All this will have been effected at an expense which is almost *nil*, and without any of the heavy cost and serious disadvantages of having a special corps of trained men.

Winter Shoeing.

The shoes worn by horses should not only protect their feet from external injury, but should also afford them security of foothold. I have shown that the new pattern shoe adopted in the Army does this in ordinary circumstances, by its concave ground surface, which also prevents stones, mud, and to some extent snow, from lodging in the sole. But for ice or slippery pavement—such as granite, wood, or asphalte in damp weather—something more is necessary to afford a secure grip.

Though our war operations generally take place in countries in which the winters do not require any special provision against ice-travelling, yet with our Crimean experiences still fresh in our memories, and the experiences of other nations to refer to, the necessity for being prepared for such an eventuality as a campaign in an ice-producing climate must not be lost sight of.

The Russian Campaign of 1812 furnishes an instance of the need there is for providing armies, not only with shoes to protect the hoofs from wear, but appliances which will make them independent of the winter in northern and western climates. The reference to this is to be found in Thiers' "History of the Consulate and the Empire" (Vol. XIV). He writes:

"Napoleon left Dorobourg on the 6th of November. The whole of the Army followed on the 7th and 8th. The cold had become more susceptible, and once more gave rise to painful regrets at having forgotten to provide winter clothing; and another regret yet more baffling—that of procuring frost nails for the shoes of horses. The season in which the Army had left, and the belief that it would be able to return before the setting in of unfavourable weather, explains this double omission. Our unfortunate soldiers marched along, wrapped up in every kind of clothing saved from the flames at Moscow, without being able to guard themselves against a temperature of 9° or 10° (Reaumur); and at each ascending portion of the road, the artillery horses, even when the usual number required was doubled and trebled, were unable to drag the guns of the smallest calibre. Flogged until they were covered with blood, and their knees torn with frequent falling, they were found incapable of overcoming ordinary obstacles, through loss of strength and want of means to prevent their slipping on the ice. The ammunition waggons were abandoned, and scarcely any ammunition was saved. Soon after, the guns had to be surrendered as trophies to the Russians, but not without pain and shame to our brave artillery. The carriages were thus greatly diminished in number, and every day saw the losses augmented, and the horses expiring on the road."

(*To be continued.*)

THE FITZWYGRAM PRIZES.

We are requested to announce that Lieutenant-General Sir F. Fitzwygram, Bart., offers for 1891 the same veterinary prizes as last year. The conditions will be the same, or much the same, as before.

Reviews.

A Manual of the Diseases of the Camel. By John H. Steel, V.S., A.V.D., F.R.C.V.S., F.Z.S. (Madras: G. W. Taylor. 1890.)

A melancholy interest attaches to this book, for the reason that it was the last fruits of the too brief professional career of Mr. Steel, whose untimely death we announced last month as occurring at Bombay.

This is one of the Indian Veterinary Manuals which the author was ambitious to issue for the guidance of veterinary surgeons and others in our Eastern possessions, and stands third in the list of those already published. Like the two preceding Manuals, it is as complete as the personal experience and extensive reading and research of our deceased friend could make it, and is an important and very interesting addition to professional literature. Its value to our Army brethren will be great, as it contains much information with regard to the management and utilisation of that very useful, but somewhat peculiar animal—the camel.

An examination of the contents of the work will show that it appeals to a wider class than perhaps the author intended it; for it treats of the natural history of the animal, its varieties, anatomy and physiology, as well as its diseases, with cameline therapeutics and materia medica in addition. The value of the book is increased by a number of plates,

which complete otherwise excellent descriptions. As a whole, the work is the crowning stone of the extensive literary edifice reared by one to whom such labour was as congenial as it was, and is, beneficial to others; and the painful regret that arises that we have lost one of our best workers, is but slightly assuaged by the knowledge that through his toil on our behalf he will always be gratefully remembered.

THE DOG OWNERS' ANNUAL FOR 1891. (London: Dean and Son.)

This is another of those wonderful annual productions, which, got up for a particular class, yet enlist the attention of many besides.

It is somewhat of a marvel how such a book can be produced for a shilling, unless it be explained by the expectation of an enormous sale. This year the DOG OWNERS' ANNUAL is even better than last year's, for it contains more illustrations and more attractive articles on almost every subject relating to dogs. There are papers to suit the tastes or the requirements of everyone who keeps or admires these animals, and even the veterinary profession, in addition, is catered for—therapeutically—by Mr. Millais' important article on inoculation for distemper, and Mr. Moore's on the homœopathic treatment of the same serious malady. These are well worth perusal.

The figures representing the different breeds and the prize-winning dogs are excellent. To those who desire to know what is going on in the canine world we would recommend this annual, as it appears to contain information upon pretty well everything concerning the friend and companion of man.

VINTON'S AGRICULTURAL ALMANAC FOR 1891. (London: Vinton and Co.)

This publication appeals more especially to the agriculturist and stock-breeder, and the issue for 1891 is in every respect equal to those of previous years, in meeting the demands of those for whom it is prepared. The special articles are written by well-known authorities on their particular subjects, and the other information with regard to fairs, shows, farm and garden work, proceedings of societies, etc., appears to be very complete. The two portraits of Earl Cathcart and Sir Thomas Dyke Ackland are excellent. The price of the Almanac is only sixpence.

THE INDIAN VETERINARY JOURNAL. (Lahore: The Editor.)

We heartily welcome a namesake in the Far East, and we as sincerely congratulate Mr. Pease on his bold venture of bringing out a quarterly professional Journal in a native language—Urdu. This is, we believe, the first attempt made to publish such a periodical, and it is to be hoped that the Editor may obtain a full measure of success. Such an attempt shows not only the progress Veterinary medicine is making in India, but the kind of men there are now in the Army Veterinary Department. Surely such enthusiasts should be encouraged and rewarded. Of the ability of Mr. Pease to conduct such a periodical there is ample proof, as he has passed the higher standards in some of the native tongues, and his being selected as a teacher in the Lahore Veterinary School is evidence of the estimate the authorities at Simla place on his profes-

sional qualifications. The first number will come as a novelty and a surprise to European Veterinarians, few of whom, it is to be feared, will be able to peruse it. But in India, and especially in the Punjab, it will, we trust, be read by the native salootries and medicine men, to their profit, and to the advantage of animals and their owners. It is no light task Mr. Pease has taken on himself; but if he is at all adequately supported, he will not be deterred from carrying on the good work he has so auspiciously begun. He well deserves the countenance and aid of everyone who wishes to see Veterinary knowledge extended in India amongst the native population, and we shall anxiously watch the progress of our compeer in this direction.

Proceedings of Veterinary Medical Societies, &c.

ONTARIO VETERINARY ASSOCIATION.

THE Annual Meeting of the above Association was held in the Ontario, Veterinary College, Toronto, on December 19th, 1890.

In consequence of the absence of the President, Mr. D. McIntosh, the Vice-President, Mr. W. GIBB, took the chair. In opening the meeting he made a few appropriate remarks, regretting the absence of the President, who had written expressing sorrow at his not being able to attend.

The Secretary's, Treasurer's, and Auditors' reports were then read, showing the finances of the Association to be in a good condition.

The REGISTRAR reported two graduates registering at the last meeting, and seventeen since the meeting up to date.

Calling the roll was dispensed with, and the following gentlemen were present at the opening of the meeting, several others came in before its close: Prof. Smith, Messrs. O'Neil, Quinn, Shaw, J. H. Wilson, J. Wende, Lloyd, Gibb, C. Elliott, W. Cowan, McArthur, Hand, Steele, Hawkins, Gallanough, W. G. Wilson, Heslop, Hopkins, and Sweetapple.

Mr. Heslop, of Appleby, Ontario, and Mr. F. J. Gallanough, of Thornhill, were duly proposed and elected members of the Association.

Mr. Hawkins, of Detroit, was elected an honorary member of the Association.

On the motion of Prof. SMITH, seconded by Mr. J. WENDE, Dr. Hinde Roper, of Philadelphia, was elected an honorary member.

The payment of dues then took place, and in the discussion on those in arrears it was moved, seconded, and carried that members three years in arrears shall be struck off the roll.

Mr. O'NEIL, of London, read an interesting paper on "Soundness," and a lengthened and animated discussion took place, in which Messrs. Lloyd Hawkins, Elliott, Wilson, Wende, Shaw, and others took part, on the various conditions constituting soundness and unsoundness.

Mr. JOHN WENDE read an interesting paper on "Prolapsus Uteri in the Bitch."

It was moved by Mr. WILSON, seconded by Prof. SMITH, and carried, that the thanks of the meeting be presented to the readers of papers; and the Secretary was instructed to forward them to the Veterinary Archives of Philadelphia and to the Veterinary Journal of London, England.

Dr. DUNCAN suggested that the sloughing might have been produced by lowered vitality similar to that produced by ergot, but in these cases produced by cold.

Professor SMITH suggested that cold and slush, perhaps salt or snow on ice—sometimes put on to keep the tracks of street cars clear—may possibly produce it, but he believed it due to some local poison, probably a micro-organism, and he advocated the use of pretty strong antiseptics, such as carbolic acid; he did not recommend poulticing.

It was moved, seconded, and carried that the Secretary should procure some more copies of the Tariff; also get out a printed list of registered graduates.

Mr. Gibb vacated the chair, and Mr. Cowan presided.

The election of officers then took place, with the following result:

Mr. W. Gibb, St. Mary's, President; Mr. D. McArthur, Ailsa Craig, 1st Vice-President; Mr. J. Wende, Buffalo, N.Y.U.S., 2nd Vice-president; Mr. C. H. Sweetapple, Toronto, Secretary; Mr. W. Cowan, Galt, Treasurer; Messrs. O'Neil and Elliott, Auditors; Messrs. Burns, Hand, W. H. Wilson, Steele, Gallanough, Hopkins, Ormsby, Lloyd, Directors; Messrs. J. H. Wilson and O'Neil, Delegates to Western Fair Association; Mr. W. Cowan, Delegate to Central Permanent Farmers' Institute; Professor Smith was elected Honorary President.

Mr. Cowan vacated the chair, and the President-elect, Mr. GIBB took his seat. He thanked the gentlemen for the honourable position in which they had placed him, and promised to do all that lay in his power to forward the best interests of the Association, and also for the profession at large. He said that he thought it was the duty of every qualified practitioner within reach to support the Association by his presence at its meetings.

Mr. MCARTHUR, Mr. J. WENDE, and Mr. HAWKINS also gave addresses.

Mr. HAWKINS spoke in disapproval of qualified practitioners associating themselves with empirics. He also mentioned that many prominent positions were occupied in the United States by graduates of the Ontario Veterinary College, and was greatly in favour of the summer practice which is required of all students who attend this College.

It was moved, seconded, and carried that the sum of 25 dollars be appropriated for a medal to be competed for by the students of the Ontario Veterinary College at the approaching spring examination.

The usual fee of 50 dollars was then voted to the Secretary for his services.

Mr. SHAW described a case of amputation of a portion of the anterior part of the inferior maxillary bone, and also, at the request of Dr. Duncan, described the operation for roaring.

Dr. DUNCAN remarked that Professor Axe disapproved of the operation in consequence of the severity of the cough that supervened.

Professor SMITH said that the general opinion amongst veterinary surgeons in Great Britain was not in favour of the operation. But that it might, perhaps, be beneficial in some cases for slow work.

At the close of this discussion the meeting adjourned.

NOTTINGHAM MEDICO-CHIRURGICAL SOCIETY.

Tuberculosis in Cattle.

AT the meeting on January 21st, Dr. BOOBBYER exhibited the lungs, heart, liver, spleen, and some lymphatic glands from a cow which had recently been seized, slaughtered, and destroyed by the town authorities after exposure for sale at the fat stock market of the borough. He pointed out the very extensive infiltration of tuberculous matter, and comparatively small amount of necrotic action. All the internal organs, excepting the heart, were more or less invaded. The left lung was affected in almost every part with miliary tubercle, and the liver was thickly studded with deposits of various sizes—some as large as oranges. He said the physical signs and special symptoms

in so pronounced a case as this almost necessarily implied a guilty knowledge on the part of the vendors, though the magistrates before whom the case was taken declined to accept this view. The general emaciation, arched back, retracted abdomen, and staring coat, together with the frequent cough, jerky respiration from pleuritic adhesions, and continuous diarrhœa, were indications which could not well be mistaken. Dr. Boobbyer briefly drew attention to the experiments of Toussaint, Bouley, Chauveau, Cornil, Arloing, Nocard, Peuch, Gerlach, Johne, and others, with the flesh or juices of tuberculous animals upon others in a previously healthy condition, both artificial injection and natural ingestion being used, which all went to show that great risk of infection attended the use of the flesh of tuberculous animals as food. Dr. Boobbyer described the attitude of the home and some Continental governments and local authorities with respect to the very important question of how far tuberculous disease in animals ought to be considered to render them unfit for food, and said the Sheriff of Glasgow probably erred, if he erred at all, in the right direction when he decided that the simple presence of the disease, however slight its development, was in itself a sufficient disqualification.

PATHOLOGICAL SOCIETY OF LONDON.

Morphology, Cultivation, and Toxic Products of the Tubercle Bacillus.

At the meeting of this Society on February 3rd, Professor Crookshank gave a demonstration of Tuberculosis under thirty-four microscopes—including twenty-three 1-12th oil immersion objectives—to illustrate his paper. The preparations were tubercle bacillus in sputum and pus from different cases in man, in pure cultivation, in glycerine, agar-agar, glycerine broth, broth without glycerine, and glycerine milk; in cream from a tuberculous cow; in liver of fowl; in lung of guinea-fowl; in lung of ostrich; in lung of rabbit; from tuberculous udder; in miliary Tubercle in a calf inoculated with human tuberculous sputum; in lung of horse; in spleen of tuberculous guinea-pig; several preparations illustrating the tubercle bacilli and "phagocytes" from frogs inoculated with pure cultivations; lastly, microscopical preparations of the crystals obtained from the extract of cultures and of tuberculous tissue. More than sixty cultivations were exhibited of the tubercle bacillus; on glycerine agar-agar inoculated April 17th, June 28th, July 22nd, September 15th, October 15th, December 8th, 1890, January 14th, 1891; in glycerine broth, broth with glycerine, broth without glycerine, with alkali and glycerine milk, November 11th, 1890; glycerine broth, November 13th and November 28th, 1890; and filtrates prepared December 5th and December 9th, 1890. Chemical tests applied to the extract of glycerine cultures and Koch's own liquid were also demonstrated. After referring to the researches commenced in 1888 on the morphology of the bacillus in different cases in man and in Tuberculosis in different animals, Professor Crookshank gave the steps by which he was led to cultivate the bacillus, and to confirm and extend the researches of Nocard and Roux. The macroscopical and microscopical characters of cultivations in different media were fully described and illustrated by diagrams and drawings, and by photographs projected on the screen. Stimulated by Koch's announcement at the International Medical Congress, Professor Crookshank cultivated the bacillus in liquid media, and later prepared cultures in milk, from which the bacilli were separated by filtration through porcelain. Before giving the details of these experiments, Professor Crookshank gave a detailed historical sketch of the researches on ptomaines, toxines, and albumoses. Special stress was laid upon the more recent work of Wooldridge, Hankin, and Martin. Professor Crookshank then described his own experiments. Having obtained by December 5th several batches of cultures in glycerine broth, the next step was the separation of

the bacilli by filtration. The filtrate was perfectly transparent, alkaline in reaction, and yellowish-brown in colour. The filtrate was evaporated over sulphuric acid in a vacuum, and at a low temperature. This proved to be a very tedious process, occupying from December 8th to January 12th. The filtrate was then reduced to a brownish viscous residue, consisting principally of the glycerine in the original culture fluid. This extract proved to be extremely toxic. Two minims of the diluted extract produced in a guinea-pig rapid fall of temperature, erect coat, periodic irregularity of the heart's action, irregular muscular spasms, loss of control over the extremities, and death ensued. Details of the separation and effects of pure material were promised later in a joint paper with Mr. Herroun. The following tests applied to the original filtrate gave these reactions: Phosphotungstic acid, a copious white precipitate; potassic bismuthic iodide, a distinct orange-yellow; potassic ferricyanide, after standing a few minutes, a beautiful blue on the addition of ferric chloride; iodine in iodide of potassium, precipitate after some hours. The precipitate contained extremely characteristic crystals. Phosphomolybdic acid gave a yellowish precipitate and a blue colour on the addition of ammonia, which disappeared on boiling. Professor Crookshank concluded that the tubercle bacillus probably produced a complex proteid poison, in which, as in Anthrax (Martin), the alkaloid of Tubercle or tuberculine was in a nascent condition. According to different stages of cultivation, there would be a complex proteid substance, or this substance with free ptomaine or ptomaine alone. Another line of inquiry was to obtain an extract from the tuberculous glands of cows suffering from Perlsucht. Further details of the preparation were given. The filtrate gave similar reactions to extracts of artificial cultivations of the bacillus. The chemical reactions in liquid supplied by Koch were as follows: Alcohol added in excess, a turbidity; phosphotungstic acid, a white precipitate; potassic bismuthic iodide, slight orange precipitate; potassic ferricyanide, after standing a few minutes, gives the Prussian blue test on the addition of ferric chloride; iodine in iodide of potassium, after standing, an amorphous precipitate; phosphomolybdic acid, a yellow precipitate, blue colour on addition of ammonia, which disappeared on boiling. Koch had not yet published the chemical and physiological properties, and the exact mode of preparation and determination of the dose of his liquid; and Professor Crookshank concluded by cautioning anyone against making the details of his purely pathological investigation a basis for the preparation of a liquid intended for experiments on the human subject, and instanced the toxic effects on the guinea-pig of the extract of glycerine cultures.

Tuberculous Guinea-pigs under Koch's Treatment.

Drs. ABRAHAM and CROOKSHANK made a joint communication on the effect of Koch's treatment on tuberculous guinea-pigs with liquid received by Dr. Abraham from Berlin. Two tuberculous guinea-pigs had received six injections since January 7th, in centigramme doses. Similar doses were, at the same time, administered to a healthy guinea-pig. As further control observations, two guinea-pigs in the same stage of Tuberculosis were carefully examined, both macroscopically and microscopically, after death, as a guide to the condition of the arterial organs in the cases selected for treatment. The lymphatic glands were caseous and contained bacilli. There were deposits in the spleen, which also contained bacilli. The cases selected for treatment were therefore undoubtedly tuberculous without the disease being too far advanced. There were well-marked chains of tuberculous glands, but the animals were, nevertheless, active and well nourished. The first injection caused considerable constitutional disturbance, rise of temperature, tenderness and great swelling of the diseased glands, and redness of the surrounding skin. The

second and subsequent injections produced a rise of temperature and tenderness, but no sudden glandular swelling. In one guinea-pig the glands had steadily increased in size; in the other there had been but little change since the first injection. The temperature "reaction" was most marked in the former after the fourth injection, when it reached 107·4° F. in two hours. With exception of a very slight rise in temperature, the healthy guinea-pig was not affected by the injection. So far, these cases showed that in tuberculous guinea-pigs Dr. Koch's fluid, in centigramme doses, produced similar phenomena to those observed in the human tuberculous subject. Whether the fluid would arrest the progress of the disease remained to be seen. The average life of tuberculous guinea-pigs was about sixty days. A cow suspected of being tuberculous was injected on two occasions with doses of 2 and 3 centigrammes. The temperature taken hourly remained normal, but increased cough was observed for some hours afterwards. The case was still under observation. The authors promised to continue to extend their observations, and to place the results before the Society at a future meeting.

Dr. PHINEAS ABRAHAM stated that in consequence of the alarmist reports as to the dissemination of bacilli in patients under the "Koch" treatment, he had within the last week examined the blood of the two guinea-pigs before and during reaction. He had also examined the blood of ten human patients now undergoing the treatment, in some cases before, and also during, and after the reaction. They included five cases of lupus, two of phthisis, two of strumous joints, and one of leprosy. In no single instance had he been as yet able to detect any bacilli. He considered, therefore, that if any such metastasis took place, as was indicated by Dr. Liebmann's observations, it was certainly not of common occurrence.

Dr. GRUN asked if there were any changes to be seen in the tubercle bacilli in the guinea-pigs after the injection of Koch's fluid.

Dr. ABRAHAM replied in the negative.

Dr. SYDNEY MARTIN thought that the question of cultivating media was an important one. The idea was now given up that any pathogenic bacilli acted mechanically. Their effects were due to their forming products which were poisonous. These poisons had not yet been sufficiently studied. One reason for this was that media, from which it was difficult to separate these products had been used for cultivations, and so the products had not been obtained in large quantities. It must be remembered that the proportions of salts, etc, in broth and in gelatine were quite different to those found in the body, and the same was true of glycerine agar-agar. If the bacilli were started in alkali albumen with the same proportion of salts as were found in serum, their growth would be as luxuriant as in glycerine agar-agar or any other medium. Alkali albumen was—media of which it was possible to sterilise—the one which had the nearest resemblance to the body structures. The opinion was growing that the bacilli manufactured their poisons from proteid substances, fats, and carbohydrates being unacted on. He suggested that it was probable that we were on the road to form generalisations about the products formed by pathogenic organisms. Proteids were the precursors of the bodies formed by bacteria, and as by ordinary digestion albumoses were formed from proteids, and then by further processes pepto-toxin could be obtained, a basic body with a definite formula, so might the pathogenic bacteria produce alkaloid bodies from proteids. He had shown that the anthrax bacillus formed a specific alkaloid, which, on injection, produced all the symptoms of Splenic Fever, and it might be found that all virulent organisms formed alkaloidal poisons. Professor Crookshank had suggested that tubercle bacilli produced an alkaloid, but the reactions which he had shown were not to his (the speaker's) mind sufficient to settle this. In order to be certain that an alkaloid was present, it was

necessary to isolate it, and then to form definite salts with it. It was possible that slowly-growing organisms never got further than forming proteid poisons. The action of these bodies in producing the lesion of their respective diseases should be carefully studied, and all the albumoses were of interest in this respect. Anthrax albumose produced fever, but so also did the peptic albumose formed in ordinary digestion. The fever produced by the injection of Koch's fluid into animals was exactly similar to that produced by the injection of a large dose of ordinary peptic albumose. He was at present of opinion that an organism could not produce a proteid poison sufficiently powerful or in sufficient quantity to produce death, and that if such a result occurred, it must be due to the presence of an alkaloid. He hoped that Professor Crookshank would succeed in separating an alkaloid from the cultivations of tubercle bacilli.

Dr. WOODHEAD felt that there was another side to Professor Crookshank's paper than the one Dr. Sidney Martin had been considering. In a complete study of the tubercle bacillus it was necessary to try and trace its morphological place in the bacteriological kingdom, to trace its life-history both within and without the body, to study both its parasitic and saprophytic aspects, as this was necessary in order to determine its position as a cause of disease. The study of this question from a chemical point of view was extremely important, particularly at the present time, and it was a side which was but too often left out of account by bacteriologists.

Dr. JOB COLLINS, after referring to the classical experiences of Buchner with bacillus subtilis and bacillus anthracis, thought that the position with regard to bacteria would become considerably modified, and it might be that their action was comparable to the unorganised ferments of the body. Professor Crookshank's paper would lead to more attention being paid to the chemico-physical results of the presence of bacteria than merely to their morphological aspects.

Mr. SPENCER asked Dr. Crookshank what his experience had been in the cultivation of bacilli at other than the body temperature, and referred to Dr. Crookshank's microscopical slides, which showed phagocytes of frog's lymph devouring tubercle bacilli.

Dr. W. HUNTER said that, in his excellent historical review, Dr. Crookshank had done well to draw a sharp line between the researches on alkaloids and proteid bodies. The former had been chiefly studied in the Italian, French, and German schools, but the latter were essentially of British origin and study. The late Dr. Wooldridge had been the first to follow this line, but owing to his unfortunate nomenclature and the difficulties that a few years ago beset the subject, his results had not been so widely appreciated as their intrinsic value deserved. Mr. Hankin and Dr. Martin had, however, since then conclusively established their importance in the symptomatology of disease and in explanation of their relation to immunity. Brieger and Fraenkel had since described a series of bodies derived from bacterial cultures, to which they had attached the name of toxalbumins. Professor Crookshank's experiments with his extract were interesting. Its injection had at first produced a marked lowering of temperature, and he had observed the same fact in cases, particularly those progressing favourably, treated with Koch's fluid. With reference to the question of the production of immunity, these so-called toxalbumins had the power, as shown by injections of Koch's fluid, of inciting the cells round caseous foci to an activity of which they had previously been incapable. In the lung from a patient who had died whilst under treatment by injections of Koch's fluid he had seen intense cellular infiltration, which had evidently been actively engaged in causing the absorption of caseous foci. They might therefore be able to strengthen the natural properties of the cells in combating the poison. However important the tubercle bacilli might be in

the production of the disease, it must not be forgotten that it was the inherent weakness of the cells which allowed the body to be attacked by them, and in order to attain successful treatment it would be necessary to so raise the tone of the cells that they should be able to resist the disease.

Professor CROOKSHANK said he had already come to the conclusion that the small amount of toxic substance produced was due to the fact that the usual media were not rich enough in proteids, and he had already begun to use alkali albumen, as Dr. Martin had suggested. He had also gone somewhat further in isolating his extract than he had indicated in his paper. In answer to Mr. Spencer, he referred to Sir Hugh Beevor's recent paper before the Society, in which he had described the growth of tubercle bacilli at ordinary temperatures. He had injected cultivations of tubercle bacilli into the dorsal lymph sacs of frogs, and on examining the blood later phagocytes could be observed taking in the bacilli. But which were going to win—bacilli or phagocytes—he did not yet know. In carrying on researches such as he was pursuing the chief requisites were carefully-prepared media, a good incubator, and a thoroughly reliable trained assistant.

Cervical Teeth.

At the meeting on the 17th ult., Mr. BLAND SUTTON showed a sheep's ear, in connection with which was a persistent second branchial cleft, and attached to it was a flap of skin, known as a cervical auricle. The edge of this flap was covered with papillæ like those found on the lip of a sheep, and in the cleft there was a tooth somewhat similar to a sheep's incisor. The second specimen was a tooth which had been removed from a persistent second branchial cleft in a horse. Teeth had been found in connection with the petrous bone in oxen, and two cases had been described by Magillot, which were preserved in the veterinary museum at Alfort, near Paris. Teeth had occasionally been found in the second branchial cleft in man, and he mentioned one case in which a tooth was cut behind the angle of the jaw in the neck, in the usual position of a persistent second branchial cleft. This had been erroneously supposed at the time to be a wisdom tooth which had wandered.—Dr. ORD remarked on the great interest of these cases, and asked Mr. Sutton whether the teeth conformed to the mammalian type or approached that of some of the lower vertebrates, as some fishes had teeth on their branchial arches.—In reply, Mr. BLAND SUTTON stated that the teeth were of strictly mammalian character. He then referred to dermoid cysts, the contents of which also conformed to the type of the animal in which they were found. It was, however, interesting that teeth had only been found in dermoid cysts which were connected either with the ovary or the neck.

ROYAL AGRICULTURAL SOCIETY.

AT the monthly meeting held on February 4th, Sir JOHN THOROLD reported that Prof. Brown had presented his usual report, and the annual report of the Royal Veterinary College, which the committee recommended for publication in the Journal. The subject of Pink Eye in horses had been discussed in reference to a note on this disease by Professor Axe, written for the next number of the Journal. The examiners in Practical Cattle Pathology for the diploma of the Royal College of Veterinary Surgeons in 1890 had reported that the following gentlemen, placed in order of merit, had attained the greatest distinction:—(1) J. E. Row, 2, Torbay Park, Paignton, Devon; (2) F. E. Place, Church Street, Southwell, Notts. The committee recommended that the Society's large medal be given in silver to Mr. Row, and in bronze to Mr. Place. The committee recommended the appointment of Mr. Lewis P. Rees, of 5, Lammas Street, Carmarthen, as Provincial Veterinary Surgeon for Carmarthenshire.

Professor Brown's Report.

Pleuro-pneumonia.—During the four weeks ended January 24th outbreaks of this disease have been dealt with by the Board of Agriculture in the counties of Durham, Essex, Lancaster, Surrey, York (W.R.), Aberdeen, Ayre, Fife, Forfar, Linlithgow, and Midlothian. By order of the Board fifty cattle affected with Pleuro-pneumonia in various stages were slaughtered, as well as 510 other cattle which had been in contact with the diseased animals, or otherwise exposed to infection.

Anthrax.—Of this disease fifteen fresh outbreaks were reported in the four weeks in the counties of Bucks, Cumberland, Hants, Hunts, Lincoln (Kestevin), Norfolk, Rutland, Somerset, York (W.R.), Aberdeen, and Dumfries. In these outbreaks thirty animals were attacked, eight diseased animals were killed, fifteen died, and five recovered.

Swine Fever.—This disease is again decreasing, and has been so for some weeks. In the four weeks of November the outbreaks reported in Great Britain amounted to 411, or just on 103 per week. In December they fell to 343, or about eighty-six per week, whereas in January they still further declined to 248, or sixty-two per week. In these January outbreaks, 1,968 pigs were attacked, 864 diseased pigs were killed, 900 died, 265 recovered, and 412 remained alive when the last published return was made up.

Rabies.—There have been six cases of this disease, all of them in dogs, reported in the month; one of these occurred in Hants, two in Kent, and three in York (W.R.).

Army Veterinary Department.

Gazette, February 17th.

Veterinary Surgeons E. H. Kelly and E. E. Bennett, F.R.C.V.S., to be Veterinary Surgeons, First Class, ranking as Captains.

W. J. Tatam, Gent., to be Veterinary Surgeon, ranking as Lieutenant, vice J. H. Steel, F.R.C.V.S., deceased.

Veterinary Surgeons Queripel, Mills, Savage, and Short have embarked for a tour of service in India.

Veterinary Surgeon Dwyer has returned to England for a tour of home service.

At the Levée held by his Excellency the Lord Lieutenant of Ireland, at Dublin, on February 3rd, Inspecting Veterinary Surgeon H. Thomson, A.V.D., was presented by General Viscount Wolseley, K.P.; Veterinary Surgeon (First Class) F. F. Crawford, by Inspecting Veterinary Surgeon Thomson. Veterinary Surgeon (First Class) J. Reilly attended the Levée. The above three officers also attended the Drawing Room on the evening of the 4th February.

At the attack on Tokar on February 19th, when the forces of the Mahidist chief, Osman Digma, were defeated with great loss, the Egyptian Cavalry, commanded by Captain Beech, C.M.G., late of the Army Veterinary Department, materially assisted in securing the victory by a brilliant charge, in which Captain Beech was slightly wounded, while endeavouring to rescue a wounded Egyptian officer. The wound, we believe, is not likely to unfit him for duty. It has been remarked that the services of our late colleague are an almost complete record of every military exploit in Egypt since Tel-el-Kebir. As the result, he has no less than seven clasps to his Egyptian medal, and in this respect stands, we think, quite alone. We have again to congratulate him most cordially on his new laurels.

Obituary.

MANY members of the profession will be grieved to learn that W. Woods, F.R.C.V.S., Wigan, died on January 31st, at the age of sixty-five years, after a somewhat lingering illness. Studying veterinary medicine and surgery at the Dick Veterinary College, when that school was at its zenith, he obtained the certificate of the Highland and Agricultural Society of Scotland in 1854, and on the relinquishment of the certificate system by that Corporation, he became a member of the Royal College of Veterinary Surgeons in 1866.

In 1877, on the institution of the Fellowship degree, he was elected a Foundation Fellow, and from 1882 until his death he held the office of Vice-President; in 1888 he was appointed an examiner for the Royal College. The duties of these offices he carried out in a thoroughly conscientious and satisfactory manner, and few could rival him in his regard for professional probity, proficiency and decorum. Unassuming and unpretentious, his common sense and uprightness could always be reckoned upon, and those who knew him longest and most intimately considered him ever as a dear and sincere friend. Closely acquainted with him as a student, and having the privilege of enjoying his friendship since that time, we can personally testify to the heavy loss many will experience by his departure from amongst us. He was an active member of the Lancashire Veterinary Association, of which he had been President, and he took a great interest in, and was one of the Council of, the Veterinary Benevolent and Defence Society.

In his native town—where his father, grandfather, and great-grandfather had acted as veterinary surgeons—he was held in the highest esteem, as is evidenced by the long and laudatory notices of him in the local press; but outside his profession, to which he was so ardently devoted, he never sought any prominent public position; though it is stated that had he been so inclined, he could have held some of the highest offices in the borough of Wigan. He was one of the trustees of the Wigan Mechanics' Institution, and was Government Inspector under the Contagious Diseases (Animals) Act for both the borough and the Wigan County Petty Sessional Division, and he continued to hold that position until the time of his death, with every satisfaction to the authorities and the general public. He was also veterinary adviser to the local branch of the Royal Society for the Prevention of Cruelty to Animals. It is stated that his name was next on the list for appointment as Justice of the Peace—an honour to which he was well entitled, and which he would long ago have received, had he been an active politician or desirous of occupying that office. It is consoling to know that our lamented friend is succeeded in the very extensive practice by his son, whose career hitherto warrants the prediction that he will worthily represent his father as a "good and true man."

Quite recently we recorded the death of Professor Violet, of the Lyons Veterinary School, and now we have to note the demise of Professor Rey, of the same School, at the age of seventy-eight years. Rey was one of the most prominent of the many distinguished veterinarians of France, and for very many years occupied a leading position at the Lyons School, which he entered as a teacher so long ago as 1835, as professor of Clinical Medicine and Surgery, holding the chair for thirty-nine years, and with it the respect and affection of all who knew him. He contributed largely to Veterinary literature, no fewer than 110 memoirs on more or less important subjects, being ascribed to his pen. He also published an excellent treatise on Horse-shoeing, and another on Veterinary Jurisprudence; for ten years he was editor in chief of the Journal which represents the Lyons School, and was a member of many scientific societies.

The following deaths have been reported :—

J. H. Reynolds, M.R.C.V.S., Daventry,	graduated ..	1863.
H. G. Robinson, M.R.C.V.S., Londonderry,	„ ..	1881.
John Ferris, M.R.C.V.S., Brecon, ...	„	1880.

Notes and News.

Drugging Horses.—At the Spalding Petty Sessions on February 17th, several farmers in Crowland prosecuted five horse-keepers for administering arsenic to their horses. Mr. Brown, solicitor, stated that this practice had been very prevalent in the Crowland district for some length of time, and was the outcome of a rivalry on the part of the horsekeepers to excel in the appearances of their respective teams. Arsenic for a time gives horses a glossy skin and an appearance of being well groomed, but is very injurious, and causes pain. Several horses had died in consequence of the arsenic that had been given them, while others were much damaged and reduced in value. In every case the poison had been obtained and given secretly. Most farmers keep arsenic on the premises for wheat dressing, and this is used by the men, who administer it with cut mangels. A veterinary surgeon stated that the administration of arsenic was prejudicial to breeding. One of the prosecutors stated that he had been very unsuccessful with his breeding mares, and traced it to this cause. The Chairman said the Bench took a very serious view of the case, and in the interests of the whole district they intended to make an example of the offenders, as they feared the practice was becoming alarmingly common in Lincolnshire. Three of the men were fined £5 each; two others were sent to gaol for twenty-one days with hard labour, and ordered to pay the costs.

The Skin of the Toad.—A recent microscopical study, by Herr Schultz, of the skin of toads and salamanders, has yielded some interesting results (*Archiv fur mikroscop Anat.*). There are two kinds of glands, mucus and poison glands. The former are numerous over the whole body; while the latter are on the back of body and limbs, and there are groups in the ear-region behind the eye; and, in the salamander, at the angle of the jaw. The mucus glands are spherical, have a clear glassy appearance, and contain mucus cells and mucus; the poison glands, which are in regular strips on the salamander, are oval, much larger, and have a dark granular look, from strongly refractive drops of poison, a good reagent for which is copper-hæmatoxylin. The poisonous elements are from epithelial cells lining the glands. The mucus glands are for moistening the skin, and the liquid has no special smell, nor a bitter or acid taste. The poison glands are, of course, protective, and the corrosive juice is discharged differently in toads and salamanders, on stimulating electrically; in the latter it is spirted out in a fine jet, sometimes more than a foot in length, whereas in the toad, after longer action of the current, it exudes sparingly in drops. The physiological action of the poison has lately been studied by some Frenchmen. There is no reason, according to Herr Schultz, for supposing that the mucous glands sometimes become poisonous.

The Fungus of Favus.—Dr. F. Kral, of Prague, related, at the Berlin meeting of the International Medical Congress, that in order to procure pure cultivations of the fungus of favus he rubbed the favus crusts with sterilised sand, thus finely dividing them. Cultures on plates were made, and the fungus isolated. The author's conclusions are:—(1.) The favus fungus is always one and the same fungus. (2.) This fungus is morphologically and

physiologically (in cultures) different from the fungus heretofore regarded as the fungus of favus. (3.) Its pathogenicity for man is established through successful inoculations. (4.) With the fungus from the scalp typical favus of the body was produced. (5.) In the experimentally produced favus the fungus described was always the only fungus present.

A MARE PRODUCING THREE FOALS AT SHORT INTERVALS.—In a Sydney (New South Wales) paper, an extraordinary event is reported from Mathoura Station as having occurred in Mr. Virgo's thoroughbred horse stud. Amongst the mares put to the Welsh pony Arabi Pasha, in August last year, was The Nymph, by Hawthornden—Queen of Clubs, by Cossack. This mare is known as a good performer of her time, and was the winner of the V.A.T.C. Sapling Stakes in 1883. Thirteen months after being put to Arabi Pasha—that is, on September 12th last—she dropped a grey filly foal, and then appeared in first-class health and condition; but on October 6th she created some surprise by adding a grey colt foal to the stud. The fact was deemed of so much interest, that it was communicated to a leading Melbourne sporting journal; and, in some comments upon the subject, it is stated that, although the occurrence was most unusual, it had been experienced on one occasion in New Zealand, when a thoroughbred mare had dropped three foals at considerable intervals after the one service. Since the matter was reported in the Melbourne journal referred to, The Nymph has created further surprise by dropping a third foal on October 23rd. She takes kindly to the last two foals, but will not allow the first one to come near her. The occurrence is a most remarkable one, and has only been equalled by the New Zealand instance in the history of horse-breeding.

STALLIONS *versus* GELDINGS.—The United States Senator, Wade Hampton, wrote on this subject, in reference to services in the field: "When I went to the war in 1861 I took with me three thoroughbred stallions. One was black, one was a dark chesnut, and the other was a chesnut sorrel. My father was not only a noted importer of running horses, but a famous breeder of the thoroughbred as well. I rode the black stallion at the first Bull Run battle, where I commanded the Hampton Legion. At the famous cavalry fight at Brandy Station with Pleasanton, in 1863, I rode the chesnut. He was a hard horse to control in a charge; and on that day he twice nearly carried me into the enemy's lines. I rode the chesnut sorrel at the great cavalry fight in the rear of Meade's army on the third day at Gettysburg, and came near meeting the same fate as that I escaped at Brandy Station. My experience with the thoroughbreds is, in time of war, that they are safer horses with which to get away from the enemy than when you are going towards him, especially when on a gallop. But when it comes to endurance, one thoroughbred will kill three cold-blooded horses in a campaign. They will go further with less food, go faster, and show more courage in the face of danger. I have ridden the stallions I mention into Federal batteries, and they never flinched. All of them were wounded three or four times, but they pulled through. I think a body of men mounted on entire horses would prove much more formidable in a charge than the same force mounted on geldings of the same blood. Our ancestors (in ancient times) always went to war on entire horses, and in order that their presence might not be betrayed the nostrils were slit, so that the horses could not neigh. The Arabs in their journeys prefer entire horses, as they seem to have more courage, sense, and endurance than mares or geldings. John Morgan owed his success, in the late war, to the fact that in his raids his men were mounted on Kentucky thoroughbreds."

VETERINARY SURGEONS IN THE RUSSIAN ARMY.—The establishment of veterinary surgeons in the Russian army is as follows: Veterinary Generals,

5; Veterinary Major-Generals, 10; Veterinary Colonels, 24; Veterinary Lieutenant-Colonels, 45; Veterinary Majors, 36; Veterinary Captains, 24; Veterinary Subalterns, 121.

FRENCH VETERINARY SCHOOLS.—It is proposed to establish a fourth Veterinary School at Limoges. It may be added that the Minister of Public Instruction has decided that veterinary surgeons who hold a diploma and are bachelors in letters, may enter themselves for the degree of Doctor of Medicine on particularly favourable conditions. This is following the example of Germany, where so many veterinary surgeons have graduated in medicine.

HABITS OF THE PIG.—Most people familiar with farm-stock have noticed the habit of the sow, which, before she "farrows," will make for herself a bed of straw. This, as are so many of the tricks of our domesticated animals, says the *Live Stock Journal*, is a reminiscence of the ways of a wild ancestor. In General McMaster's "Notes on Serdou," he writes there of the wild pigs of India, from which country we fancy all our domesticated animals (except the horse) originally came: "Occasionally I have come across, in the jungles, a heap of branches and grass. At first I could not make out what they were, but the Gonds informed me that these heaps were the nests or lairs of wild pigs; and they invariably turned them over to look for squeakers. These are funny little things of a tortoiseshell colour, being striped reddish yellow and dark brown." Here, then, one may learn whence the tricoloured Oxfordshire pigs, as they are now called, derived their mixed markings, just as one may trace back the Hereford white face and legs to the Indian Gaur, and the curved horns of the black-faced or Dorset flocks to the Ovis Poli—or other wild mountain sheep—still to be met with on the border line which separates the highest mountain pastures from the region of perpetual snow.

PARIS ACADEMY OF MEDICINE.—At the annual meeting on December 16th, 1890, silver medals were awarded to the following veterinary surgeons for their services in vaccination during the year:—MM. Baillet, Bordeaux; Berard, Angouleme; and Pourquier, Montpellier.

INFLUENZA.—We learn that Influenza is very prevalent in Leeds, Bristol, and Dundee, though it does not appear to be of a serious character.

THE GREATEST AMERICAN PIG.—One of the largest pigs in America, if not, in fact, in the world, was reared by a Junction City (Kansas) man. The length was 8 ft. 9 in.; girth of neck, 6½ ft.; girth of centre of body, 8 ft.; width across the hips, 30 in.; weight, 1,532 lb.

DEATH OF A FARMER FROM SYMPTOMATIC ANTHRAX.—Mr. Robert Webster, farmer, Airds, New Galloway, and a well-known breeder of Galloways, has died from blood-poisoning. It appears that about ten days ago a calf died at Airds from Symptomatic Anthrax, commonly called "blackleg." To satisfy himself as to the cause of death, Mr. Webster held a post-mortem examination. A few days afterwards he was seized with violent inflammation of the arm, apparently proceeding from a slight eruption which had been contaminated during the afore-mentioned operation.

INFLUENZA IN MANKIND IN AUSTRIA.—An official return just published on the Influenza epidemic in Austria, which lasted from the 11th November, 1889, till the end of January, 1890, states that there were nine hundred and thirty thousand four hundred and seventy-eight certified cases, and two thousand eight hundred and twenty-three certified deaths through the disease in the Empire. The total number of cases, including the many not recorded, must have far exceeded a million.

Correspondence.

CHEAP FOOD OR WANT.

SIR,—May I supplement Mr. J. Lawrence-Hamilton's excellent letter on the above subject by pointing out one available cheap source of food, viz., sparrows. These birds, so destructive to the farmer and market-gardener, are within the reach of all; they are good to eat, and it is surprising that the people, rich and poor alike, do not take advantage of the abundant supply. A lessening of their numbers would be hailed with delight by agriculturists. May the time soon come when the sparrow is rightly regarded as a source of cheap food. FRANK SILVESTER.

Hedges, St. Albans.

CAN IT BE TRUE?

SIR,—Under this heading an anonymous correspondent in your last month's number published a circumstantial statement in connection with my name. You will, I trust, permit me in reply to say—*it is not true!* Any honest man would have taken the trouble to verify such a story as that told by "Anti-Anarchist" before publishing it, and would not upon mere hearsay have added to the original falsehood a number of insulting assumptions. The letter contains only one solitary line of truth—that which states that an Army veterinary surgeon was at the dinner and protested against something. Personally, I care very little for anything said about me by correspondents, who display malice and cowardice under a concealed identity, but, as this attack affects my official conduct when President of the Central Veterinary Medical Society, I feel bound in justice to the members to explain what I really did say at our annual dinner. The accusation is that I "declined to propose the health of the Queen with remarks of an uncomplimentary character." The fact is, I did propose the toast of the Queen, and it was received in the usual manner. I made *no* remarks of an uncomplimentary character; on the contrary, I said what I felt. After some introductory remarks I said, "Her Majesty, whether considered as a Sovereign or as a woman, was equally worthy of admiration, and even the sternest Republican might honour this toast with every sense of consistency."

Later on in the evening it fell to the lot of an Army veterinary surgeon to deliver a speech, in which he thought it right to protest against something I had said, or that he imagined I had said. Whether it was his auditory or his cerebral apparatus that was defective, I am unable to say, although I endeavoured by a conversation with him to clear up the point. His ground for the exhibition of misplaced loyalty, as expressed to me, was that "even the *word* Republican should not be used in a speech referring to Her Majesty." My feelings for that gentleman were then, and have been since, nothing more unkindly than gentle pity. He was a soldier, the scene was a dinner, and, perhaps, my words were not intelligible to him—there were for him many excuses. For "Anti-Anarchist" writing deliberately a year and a half after the event there is no excuse. He had time and opportunity to verify his statements, and his conduct in not doing so is inexcusable. He has grossly libelled the chairman of the dinner and the members present, who were not likely to have tamely sat still whilst a public insult was offered to the Queen. I invite the usual explanation or apology from those who have been the means of giving publicity to an untrue statement.—Your obedient servant,

Down Street, W., *Feb. 13th*, 1891. WILLIAM HUNTING.

[We willingly give insertion to the above letter, and express regret that an incorrect version of the affair alluded to should have appeared in this Journal. We certainly do not approve of the publication of letters under a *nom de plume* which are not true. No doubt, the Army veterinary surgeon as well as the writer of the letter complained of will give their explanation.]

THE LATE PROFESSOR STEEL.

SIR,—Your notice of the late Professor Steel must have suggested to many others, as it did to me, that he lost his life in working for his profession, and that his work was more than usually of a voluntary nature. Had he been content to have only worked for himself he might still have been alive, but he would have done nothing for us. He voluntarily devoted his energy and abilities to the good of the profession, and such a life deserves our corporate recognition. Some memorial to him is necessary, if gratitude be not dead within us, and I am sure it is not. No memorial would be so much in accordance with the spirit shown by the deceased as one which incited young men to work, and I would suggest that a subscription be started at once to effect this object. You, sir, might perhaps receive subscriptions, and I am certain your aid would ensure success.—Yours truly,

180, Barnsbury Road, Islington, N. WILLIAM H. BUSH, M.R.C.V.S.

[It will afford us great pleasure to assist in any way in carrying out this most laudable object, and we are quite ready to receive subscriptions on its behalf. But a movement is now being started in the direction indicated, and the profession will doubtless hear of it shortly.—ED. *V. J.*]

ANSWERS TO CORRESPONDENTS.

J. A. MCLAUGHLIN, PROVIDENCE.—The best books on the Dog in the English language are Steel's ("A Treatise on the Diseases of the Dog") and Hill's ("The Dog, its Management and Diseases"). There is no special treatise on the anatomy of the dog, but a good idea of it is given in Chauveau's "Comparative Anatomy of the Domesticated Animals," a new edition of which is about to be issued.

J. CHRISTIE, MONTANA.—The publishers of the VETERINARY JOURNAL will forward you a catalogue of veterinary works.

Communications, Books, Journals, etc., Received.

COMMUNICATIONS have been received from E. Clarke, London; J. Wende, Buffalo, N.Y.; W. Bryden, Boston, U.S.A.; W. Woods, Wigan; J. D. O'Neil, London, Ont.; J. Laithwood, Congleton; F. Smith, A.V.D., Aldershot; T. Greaves, Manchester; C. M. Sweetapple, Toronto; J. A. McLaughlin, Providence, U.S.A.; J. Christie, Montana, U.S.A.; H. Thomson, A.V.D., Dublin; C. Goundry, Newcastle-on-Tyne; F. Silvester, St. Albans; J. A. Nunn, A.V.D., Lahore, India; W. Cox, Newcastle-on-Tyne; R. W. Burke, A.V.D., Umballa; H. C. Reeks, Spalding; A. W. Hill, London; W. Hunting, London; W. H. Bush, London; Sir F. Fitzwygram, Leigh Park.

BOOKS AND PAMPHLETS: Encyklopadie der Gesammten Thierheilkunde und Thierzucht; *Drs. Boschetti e Bassi*, Fleming's Trattato di Ostetricia Veterinaria; *F. Lupinacci e Barnchello*, Vademecum di Veterinaria Militare; *E. Aurregio*, Les Chevaux de Guerre.

JOURNALS, ETC.: *Archiv fur Wissenschaftliche und Prakische Thierheilkunde; American Veterinary Review; Clinica Veterinaria; Revue Internationale de Medecine Dosimetrique Veterinaire; Echo Veterinaire; Practitioner; Annales de Médecine Véterinaire; British Medical Journal; Journal of the Society of Arts; Indian Veterinary Journal; Johns Hopkins Hospital Bulletin; Thierarzt; Journal of the Royal Agricultural Society of Victoria; Central-Zeitung fur das Koch'she Heilverfahren; Journal de Med. Veterinaire et de Zootechnie; Recueil de Méd. Veterinaire; Repertoire de Police Sanitaire Vétérinaire; Mark Lane Express; Lancet; Journal of the Royal Agricultural Society of England; Bulletin des Seances de la Societe Nationale d'Agriculture; Clinica Veterinaria; Moderno Zooiatro; Russian Journal of Veterinary Medecine; Live Stock Journal; Edinburgh Medical Journal.*

NEWSPAPERS: *Wigan Examiner; Leeds Mercury; Wigan Observer; Yorkshire Post; Freeman's Journal.*